

digit

October 2005

Fast Track *to*

DIGITAL ENTERTAINMENT

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Digital Audio
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Digital Video
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Home Theatres
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Mobile Entertainment
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The GameZone
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Future Of Entertainment
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Bibliography
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 **Jasubhai**
DIGITAL MEDIA

YOUR HANDY GUIDE TO EVERYDAY TECHNOLOGY

Fast Track to Digital Entertainment

By Team Digit

Credits

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Contents

Chapter 1	Introduction	08
1.1	What Is Digital Entertainment?	09
1.2	Paving the Way	11
Chapter 2	Digital Audio	22
2.1	Evolution	13
2.2	The Digital Wave	18
2.3	Codecs	21
Chapter 3	Digital Video	37
3.1	The Evolution Of Video	38
3.2	Basics Of Video	39
3.3	Codecs, Again?	46
3.4	DVD	51
3.5	Playing Director	55
3.6	Portable Fun	62
Chapter 4	The Home Theatre	64
4.1	Stereo, 7.1 And More	66
4.2	Media Wars	68
4.3	Let's Talk About Money, Baby!	70
4.4	The Final Cut	73
Chapter 5	Games People Play	74
5.1	You Should Know...	75
5.2	PC or Console?	78
5.3	PC: Getting the Hardware Right	81
5.4	Consoles: Which one's right?	87

5.5	Games, Games, Games!	90
5.6	Gazing Into the Crystal Ball...	96
Chapter 6	Mobile Entertainment	98
6.1	Mobile Entertainment: Challenges and Possibilities	99
6.2	Phones As All-In-Ones	104
6.3	Mobile TV	107
6.4	Mobile Gaming: Business Perspectives	112
6.5	A Little Technical Digression	118
6.6	Mobile Gaming: A Fad?	122
6.7	The Top Ten Mobile Games	129
Chapter 7	Back To the Future	130
7.1	Upcoming Technologies	132
7.2	Copy Protection	135
7.3	Digital Entertainment in India	137
7.4	The Satellite Revolution	139
Chapter 8	Tips & Tricks	143
8.1	Ripping Tracks	144
8.3	Tips for Your Listening Pleasure	145
8.4	Windows Media Player 10	147
8.5	How To Burn A CD With Windows XP	155
8.6	Know When To Upgrade	158
Chapter 9	Whitepapers	159
9.1	Future Mobile Entertainment Scenarios	160
9.2	Digital Home, A White Paper by Digital Home Working Group	177

Welcome



Every single *Digit* reader seeks two very basic things from us: Knowledge and entertainment! Over the years we have strived to give you reams of both. In fact, the *Fast Track* series is dedicated to providing you with knowledge. We decided it was time to mix learning with pleasure. Presenting *Digit's Fast Track to Digital Entertainment*, all the knowledge you'll ever need to entertain yourself with PCs, gadgets, gizmos, cell phones and more...

1.1 What Is Digital Entertainment?

For more than 10 years now, digital entertainment has been a part of our lives and it has steadily been improving and enriching the whole experience. But what exactly is digital entertainment? Can we point fingers and say that something is or isn't digital entertainment? Not quite. But in a rudimentary sort of way, we can say that any entertainment we enjoy using a medium that is dependent on digitisation is digital entertainment. Is it really necessary to classify it thus? No, for most of it today, is digital.

From the music we enjoy to the movies we see to the games we play to even the TV we watch... everything forms a part of the umbrella that is digital entertainment.

Take the case of music. Moving from cassettes to CDs and now slowly to MP3 and other encoded formats, music has become increasingly digital. Over the last few years, it has not even been necessary for singers to be present when the instruments played. In fact, in some cases, this has provided better results!

While this did give rise to issues such as filesharing and illegal swapping of music, on the whole, the experience has been easier. No longer is there the problem of degrading quality of tapes or cassettes because CDs last longer (unless scratched) and MP3s cannot be touched physically nor can they be affected by external atmospheric changes.

But this paradigm shift has brought about additional costs to the consumer in terms of investment of hardware, be it a MP3 player or a CD player. In any case, this hardly seems to have been a deterrent considering the sales figures!

Like music, television and video have also undergone a sea change and are today so different compared to 10 years ago that they are almost unrecognisable. The ubiquitous TV is also undergoing vast changes and is at the cusp of going high

definition (HDTV) with improved audio visual quality. Once again, though, the initial costs could prove to be restrictive especially in markets like India.

Video, too has changed dramatically from the handheld 16mm cameras of yore and are today capable of writing a DVD as they shoot. In-camera effects and transitions are the next stage as are different formats and quality levels that will soon enter this arena.

And how can we forget the pint-sized wonder that is the cell phone? The cell phone is perhaps the first one to undergo a change in technology and also be accepted (or rejected). The day is not far when the cell phone could be test bed for the rest of the media.

1.2 Paving the Way

Hardware is one thing but the software that is needed is another ballgame altogether. For the technology to really work at its best the software (TV shows, movie formats or games) need to be compatible or made for the hardware.

This has spawned an entirely new industry and a great result has been the reality one can see especially in games. Doom 3, Half-Life 2 and even some sports based games (like the upcoming FIFA 06) are so realistic in their environment creation and character depiction that you could wonder if they are imitating you or you them! Even the physics in these games has reached a new level of realism and the gameplay experience is phenomenal.

But none of these could have ever worked had it not been for the open mindset of the consumer and his (or her) willingness to adapt to and wholly embrace the changes that have come about. This, more than anything, is the fillip that the developers need to continue on their quest for perfection.

While gaming has led the visual and Artificial Intelligence breakthroughs, the music industry has brought about earth shattering improvements in the aural experiences. Add to this the improving quality of our movies and TV and when you put them together, you have one fine pot-pourri that goes together as well as peas and carrots.

That, friends, is digital entertainment. Open your senses and feel the experience.

Digital Audio



The human body responds to five basic stimuli and one of them is sound. From time immemorial, man has been creating music, which, like man, has evolved with the passage of time. From Edison's Phonograph to Steve Jobs' Apple iPod, in this chapter we will talk about everything audio and also give you an insight into the world of digital audio.

2.1 Evolution

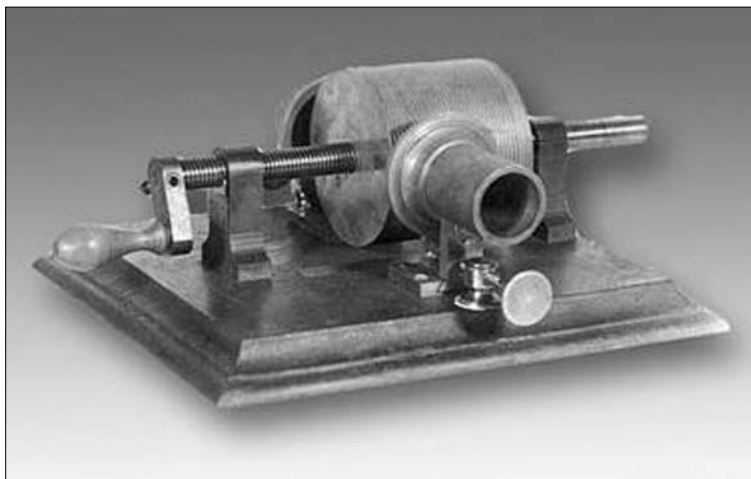
From the time we homo-sapiens learned to understand sound and create it, we have also played around with it. Be it anywhere on this planet, irrespective of religion and caste, all stories have had music associated with them. Fables usually had a bard singing for his damsel, or the Pied Piper luring the children with his captivating tunes. Music is everywhere and with music comes sound.

Although we know about Bach, Beethoven and Tansen, none of their original renditions are available to us as played by them. That's because there were no methods of recording anything at the time, except in the form of written musical notes.

Thomas Edison was someone who changed the scene with his invention of a device that could record and playback sounds. Christened the phonograph, this invention came about as a by-product of another experiment he was conducting to develop the Morse code. The technology that led to the phonograph came from developments that Edison made in the telegraph and telephone. At the time, Edison was experimenting with how a moving diaphragm that was linked to a coil could produce a voice-modulated signal. Meanwhile, he was also experimenting with a telegraph repeater that was simply a device that used a needle to indent paper with the dots and dashes of the Morse code.

From these two ideas came the concept of attaching the stylus from a telegraph repeater to the diaphragm in the mouthpiece of a telephone. The first test in July 1877 involved a sheet of paper pulled under the needle, mechanically coupled to a diaphragm, as he shouted into the mouthpiece. This however, didn't work but it did produce an unrecognisable sound, which was enough to prove that the concept was right.

Edison then went on to improvise on this and replaced the paper sheet with tin foil. The tin foil was mounted on a cylinder, and the cylinder was turned via a hand crank during recording



Thomas Edison's Phonograph

and playback. Edison turned the crank and spoke the first recorded words. "Mary had a little lamb, its fleece was white as snow, and everywhere that Mary went, the lamb was sure to go". This was the first recorded sound in the history of audio.

This, however, was just the start of a revolution in the realm of audio recording. Edison made loads of money on this invention as did his competitors. However, the storm had just begun!

Soon, the market was flooded with devices such as the Dictaphone (Columbia) and Ediphone (Edison Company), though, there was another device that we would remember from our childhood that grabbed everybody's attention and made music available to the masses.

The Gramophone

While the phonograph was being developed, a German immigrant by the name of Emile Berliner of Washington, D.C., filed and patented a talking machine that recorded and played back sound in 1888.

The technology that Emile used was similar to the Dictaphone/Ediphone, however, there was one radical difference: instead of using a cylinder, Berliner used a flat recording disc and a stylus that cut a spiral groove while the stylus in the cylinder moved up and down in a vertical cut recording format (known also as the "hill-and-dale" vertical cut) to record the audio.



Gramophone

The main advantage of such a medium was that thousands of records could be inexpensively pressed from just one 'master' record.

The Gramophone soon became a worldwide standard and is in existence even today. Although the wax discs have been replaced by vinyl LP's, this device is a treasure.

All this development was happening in the late 1800's and early 1900's. By 1930, with more technological advances, Wire Recorders became available. However, these were extremely expensive (like all new devices) and were affordable only to the rich and famous.

The Audio Tape

The ubiquitous audio tape made its appearance sometime after Wire Recorders. It soon became the media of choice to record on. Although the audio tape was still in its formative stages, it showed a lot of promise. Open reel to reel was the predominant format since the time of inception to the early '80s when digital audio started to make its appearance.



Audio Tape

Depending on the dimensions of the reel and the tracks available for recording, users could store up to 12 hours of recording on it.

The Standard Audio Cassette, or the Compact Cassette as it is called, is the final and completely refined version of the reel Audio tape. Philips developed this cassette in 1962 for their new dictation phone series and the Compact Cassette was never meant to be anything else other than recordable media for these machines. However, its compact size, reliability, low manufacturing costs and Hi-Fi stereo capability ultimately led to wide market acceptance.

The original audiotapes were made of Ferric Oxide, but later improvements such as Chromium dioxide and other metal combination tapes were used to greatly improve sound quality and reduce noise.

However, recording equipment, which could record on such media, was expensive and since Chrome tapes had different bias frequency requirements, it also needed more sophisticated recording equipment. These machines also used various Noise Reduction

technologies, of which Dolby Noise Reduction technology remains the most used till date.

With the introduction of the compact cassette, it was widely used to archive old vinyl records. The audio cassette is still going strong about 43 years after birth but the compact disc or CD as we know it today, was what made the dent in its armour. With the advent of CDs, the digital wave was well and truly on its way.

2.2 The Digital Wave

Philips and Sony were jointly responsible for inventing and bringing the CD to the masses. Research and development started on the CD back in the '70s but the finished product debuted only in 1982. As usual, it took quite some time for it to be popular because of prohibitive costs. But the CD was extensively marketed and no one could deny its exceptional sound quality and portability, which far outweighed the high cost for many consumers. With the efficiencies of mass production and affordable pricing, CD became the medium of choice by the end of '80s.

Mass acceptance of the CD ended the long running reign of LP records. Skips, crackles, pops, wow, flutter, surface noise, all synonymous with vinyl and magnetic cassette tapes, were now a thing of the past. With plummeting prices and high media reliability software companies soon began distributing software on CDs. Companies such as America Online (AOL) did numerous mass mailings of their online software. And what happened to CDs that went bad? Well, people coined a new term-coasters-that referred to CDs that were unusable and were used for everything else other than their intended purpose.

Continued product development led to the CD-R and CD-R/W formats for both audio and data. Today's higher sampling rates and bit depths have resulted in improved fidelity. The CD with its 44.1 kHz sampling rate at 16-bit depth still reigns as the audio champ, although newer technologies, catering specifically to users who want a more aural, more "being there" experience have evolved.

Technologies such as Super Audio CD, again a Philips-Sony invention and DVD-Audio are slowly doing to the CD, what the CD did to the vinyl. These newer technologies offer higher bit rates and frequencies, which, for an audiophile, is literally pleasure to the ears. We will talk about these formats later.



Fostex 8 Track DAT Recorder

As mentioned earlier, the CD format was an exceptional format for both audio and data storage but with plummeting prices and more competition, mediocrity inevitably crept into the quality of the media. Also, with the penetration of the Internet in the '90s, another revolution was silently taking form in the digital era.

Nevertheless, before we talk about the digital revolution in its truest sense, there were other worthy adversaries. Prominent amongst these was the Digital Audio Tape or DAT for short. This technology was introduced in 1987 but was limited to the professional community and some consumers. The primary reason for this was the cost (again!). From the perspective of studios, DAT offered digital storage capabilities at relatively low costs, but these costs were too high for the masses. Another factor that made DAT recorders favourable for studios was the fact that it was regarded as a professional digital format used for original mastering and therefore bypasses the SCMS (Serial Copy Management System), allowing multi-generation, lossless digital recordings.



Fostex 8 Track DAT Recorder

Sony introduced their proprietary MiniDisc (MD) format in 1998. This was supposed to be revolutionary since the size of the MiniDisc was much smaller than the regular CD but the quality of the recording was much superior and you could store up to twice the amount of content as compared to a standard CD (74 minutes). However, the MiniDisc never really gained mass acceptance despite its obvious advantages. But this was just the lull before the storm.

2.3 Codecs

By the mid '90s, usage of internet increased manifold and with the dawn of the new millennium certain radical changes were happening in the world of digital audio. Audio CDs, by far, were in charge and everybody and anybody had a CD player. Nonetheless, there was one fundamental problem. First, CD's scratch easily and second, one cannot transport a CD over the net physically.

With the Internet slowly becoming the hub of all entertainment, it was necessary to look for other, more cost effective options for a good audio-visual experience that did not hog bandwidth yet provided decent quality-both in terms of audio and video. This was the basic idea that facilitated the inception of audio and video codecs.

A "codec" can be defined as the combination of two words-Encoder and Decoder. These encoders and decoders can be either hardware or software, but we will only talk about the software codecs.

Before we actually delve into the world of software codecs, let us get our basics on digital music right.

When we talk about a software codec, it is a software program containing an algorithm to compress and then decompress data. For instance, if an MP3 file is encoded at a bit-rate of 128K from a source file that is 20MB in size (uncompressed), then the resulting file would be approximately 2MB in the compressed form, going by the 11:1 compression ratio, which the MP3 codec compresses at.

Talking about compression ratios, it is the ratio of the size of the original uncompressed audio file and the compressed resulting audio file.

Next up are the two categories of codecs-lossless and lossy respectively. An example of a lossless codec is WMA and a lossy codec is MP3. The term "lossless" means that the compressed file is

identical to the original file in all aspects. If you take a spectrum analysis of the original file and compare it with the compressed file, the resultant spectrum will be one single line with all the peaks and valleys and spikes matching each other to the 'T'. If not, it means there is some loss that is taking place during compression.

Encoding music using a lossless codec takes a lot of time and does not compress music a great deal. A 10MB file will be compressed to a maximum of about 7MB using WMA (Windows Media Audio) 9. There are other codecs such as AAC (Advance Audio Codec) and Ogg Vorbis, which we will talk about in a little while. But before we talk about these codecs, let's talk about the MP3 codec, the one piece of software that started it all.

An apt example of a lossy codec is MP3. The MP3 codec uses the "perceptual coding" technique. The Fraunhofer institute in Germany, along with Prof. Dieter Seitzer of the University of Erlangen, developed an algorithm that was standardised as the ISO-MPEG Audio Layer-3.

MP3 is far more popular than any other format or codec as it allows for exceptionally small file sizes without much difference in the rendered audio quality. However, there is a large difference statistically between the original uncompressed music file and the resultant MP3 file. This is where perceptual coding steps in.

The trick that "perceptual coding" uses, is it removes information from a particular audio or video file. Users cannot "perceive" the loss of higher or lower frequencies that are present in the original file but are cut off in the compressed MP3 file. The overall music quality does not suffer but the file size reduces due to such loss of information and hence MP3 is called a "lossy codec".

If you run a spectrum analyser on a compressed MP3 file and compare it with the original uncompressed recording, you will find that there is no "one-to-one" match of the two spectrums. Very high or very low frequencies which the codec thinks is

beyond audible perception of the user are cut off.

Codecs such as AAC, Ogg Vorbis etc. use different algorithms. For instance, AAC is based on the MPEG-2/4 standard and can be used as a lossless or lossy compression technique as required. So which audio codec is right for you? Read on to find out.

Choosing the right codec

Codecs are abundantly available on the Internet and are included in applications that let you use them to your advantage. In this section, before we get into using these codecs, let's get one thing clear. If you are making a recording of your own song or audio track, it is best to do it uncompressed in a format such as .wav or .pcm. If you are looking to make archives of your old tapes or vinyl LP's then you can be sure that using the above mentioned file formats will help you get the best results. But the downside is that the file size will go for a toss as saving a 4 minute audio file in the .wav format will cost you about 20MB and above in terms of disk space. As an option to this, you can use the lossless codecs that will help you save a few MB's per file. But overall, the file size will still be larger.

Next up is the part where protecting your audio files comes in. DRM (Digital Rights Management) cannot be applied for MP3 files but it can be for Ogg Vorbis (Experimental), WMP (Windows Media Player) and AAC. Therefore, if you are making an original recording, you can use AAC or WMP to restrict your recording from being pirated.

This section will only talk about software that are freely available and we are limiting ourselves to choosing between only four codecs. These are Windows Media Audio, MP3, Ogg Vorbis and AAC. We will be using applications that let us encode a single file into any of these formats. Please refer to the workshop at the end of this chapter for the results of the test that we have performed here.

From the workshop, it is quite clear that if you can compromise on the sound quality but want lower file sizes, then you will have to stick to MP3. If you are looking for a mid-sized file with decent audio quality, then opt for Ogg or AAC. For lossless encoding, only Windows Media Audio lets you do that and as seen the file size is not much different from the original .wav file.

From our listening tests, we concluded that the AAC and Ogg files were comparable in sound quality with each other while the MP3 file did feel to be missing something. Nevertheless, if you are not a fussy listener then you can make do with any of these codecs. For the fussy ones, stick to WMA or AAC Lossless.

Newer Formats

This is the age of digital music. Since the appearance of Compact Disc or CD, music has gone digital. In a nutshell, music is stored on a CD in bits or digital numbers which is then played back on a speaker. This process involves deciphering of the digital samples to analogue sound that drives the speakers using a Digital to Analog Converter (DAC). However, similar to the CD, there is a size limitation of the Audio CD.

This is where the newer formats such as DVD-Audio and Super Audio CD (SACD) step in. DVD-Audio aims to utilize the huge amount of space that it has to increase the sampling rate and to record data in surround sound rather than in stereo. Ditto for the SACD. Let us look at what these formats have in store for us.

DVD-Audio

DVD-Audio is yet another development of the DVD Forum, the group of companies that decides what should be considered a standard in the DVD arena in the years to come. The main advantage of DVD-Audio over the standard CD is the impressive audio quality. The table ahead will illustrate the differences between these two formats and you can make out the difference by yourselves.

Comparing DVD Audio and Compact Disc

Specification	DVD-Audio	CD
Audio Format	PCM	PCM
Disk Capacity	4.7Gb - Single layer	650Mb
	8.5Gb - Dual Layer	
	17Gb - Double Sided Dual Layer	
Channels	Up to 6	2 (stereo)
Frequency Response	0 - 96kHz (max)	5 - 20kHz
Dynamic Range	144db	96db
Sampling Rate - 2 channel	44.1, 88.2, 176.4KHz or 48, 96, 192KHz	44.1kHz
Sampling Rate/Multi-channel	44.1, 88.2KHz or 48, 96KHz	n/a
Sample Size (Quantization)	12, 16, 20, or 24 bits	16 bits
Maximum Data Rate	9.6 Mbps.	1.4Mbps

The above table outlines the technical specifications for PCM on DVD-Audio and standard CD's.

Another factor is that for compatibility with DVD-Video players, DVD-Audio discs can also contain audio encoded using the Dolby Digital and/or DTS formats. Here is the catch. Say, you have a DVD-Audio disc which contains both PCM audio tracks and the same tracks encoded in either Dolby Digital or DTS. This disc, if inserted in a DVD-Audio player will playback the PCM tracks ONLY and ignores the encoded Dolby Digital or DTS tracks. This will happen even if the DVD-Audio player supports the DVD-Video standard. On the other hand, a DVD-Video player will only play the encoded Dolby Digital or DTS tracks and ignore the PCM tracks.

DVD-Audio discs can store PCM tracks as well as associate video and images to tracks making it an all-round experience for the end-user. Another factor that makes DVD-Audio discs

more favorable to the RIAA (Recording Industry Association of America) is the copy-protection part. Most DVD-Audio discs have copy protection that makes it harder if not impossible to copy music of the discs.

However, there is a downside to all of this. It is the price of DVD-Audio discs, which are pretty much on the higher side compared to a regular Audio CD. The other factor is the low penetration of DVD-Audio discs in the market since they are not compatible with the billion plus CD players around the planet. Unless, you have a player that specifies that it can play DVD-Audio, you cannot use a DVD-Audio disc.

To combat this, the DVD Forum has come out with another format called the DVDPlus or DualDisc format. This is a disc with two sides. DVDPlus/DualDisc offer either DVD-Video or DVD-Audio as well as CD content so it can include video, interactivity, stills and text as well as audio. Such types of discs are also called as Hybrid Discs.

Super Audio Compact Disc (SACD)

The SACD has been developed by the same two companies, which gave us the CD, Sony and Philips. While both these companies are also a part of the DVD Forum, they have gone ahead and brought out a product that directly competes with the DVD-Audio format.

The SACD utilizes a completely different way of encoding music on to a CD. While DVD-Audio discs use PCM (Pulse Code Modulation)/LPCM (Linear PCM) and MLP (Meridian Lossless Packaging) {PPCM- Packed PCM} techniques to contain music on a disc, SACD utilizes a technology called DSD (Direct Stream Digital) and DST (Direct Stream Transfer). Both these technologies are innovative but it is PCM, which represents music more truly than the SACD DSD technology. However, the bandwidth provided by these technologies for playing music is more than enough for pleasing any audiophile.

One of the main drawbacks of the SACD is that the current implementation of the SACD is audio only and does not contain any other information for the tracks that some DVD-Audio discs offer. However, the SACD has an advantage in terms of market acceptance since there is a version of SACD available called the Hybrid Disc

Comparing the newer formats

	DVD Video	DVD Audio	SACD	DVDPlus\DualDisc
High resolution audio	No	Yes	Yes	Yes
Multi-channel audio	Yes	Yes	Yes	Yes
Audio coding	DD/DTS/PCM	PCM/MLP	DSD & DST	PCM/MLP
Max bit rate (Mb/s)	6.144	9.6	—	9.6
Video and still images	Yes	Yes	No	Yes
Menus & Navigation	Yes	Yes	No	Yes
Copy protection	Weak	Strong	Stronger	Strong
Plays on DVD-V player	Yes	Yes	No	Yes
Plays on DVD-A player	Yes	Yes	No	Yes
Plays on CD player	No	No	Yes (Hybrid)	Yes

which has been available for a long time even before DVDPlus discs were introduced. Similar to the DualDisc, the Hybrid disc contains one high-density SACD layer that is only visible to SACD players while the CD layer is visible to the regular CD players. So you get the best of both worlds. So how do these formats compare with each other? Let this table give you a heads-up on that.

With these newer formats, digital audio has been completely transformed. Technologies such as MLP and DSD have packed



The Archos AV700

more information on one single disc without losing information that the quintessential audiophile will miss. Welcome to the new wave of audio!

Companions on the move

The Walkman or for that matter the Discman remains the mode of portable music for people on the move. However, with the advent of digital music and the iPod (of course!) the Digital Audio Player is now on the warpath to become the new portable audio solution for people on the move.

Digital Audio Players or MP3 players as they are known commonly debuted in September 1998 with the release of the Rio 300 portable MP3 player from Diamond Multimedia. Nevertheless, with that came a lawsuit from the RIAA that prevented Diamond from selling its players to prevent piracy. Diamond counter-sued and after a bitter legal battle, Diamond Multimedia finally won the lawsuit. By the summer of 1999, the Rio 300, along with the

Creative Nomad and other portable players, became the new, must-have gadgets around the world.

The first players were only able to playback MP3 files and were not free of the occasional hiccups that made the pleasure of listening to music on the go, a sudden death wish. The players would hang playing music or playing back VBR encoded MP3 files that was a more common malady. Nevertheless, as with every new technology, each new generation brings in improvements and newer additions. Today, a MP3 player or Digital Audio Player (to be more politically correct) can playback MP3/WMA/OGG/ASF/AAC and other file formats. Even the most basic Digital Portable Audio Players available today can playback MP3 and WMA encoded files while the other file types are optional.



Talking about Digital Portable Audio Players, how can we miss the Apple iPod? One look at an iPod and anyone will be hooked on to it. The Apple iPod is more than responsible for making Digital Portable Audio Players a rage amongst the masses.

Newer players that do not sport the iPod tag are also available and their features sometimes far surpass those present on the iPod. However, the iPod still remains an icon when it comes to owning a Digital Portable Audio Player.

(Check out our comparison on the latest and the best available in Portable Digital Audio Players segment in this issue of *Digit*)

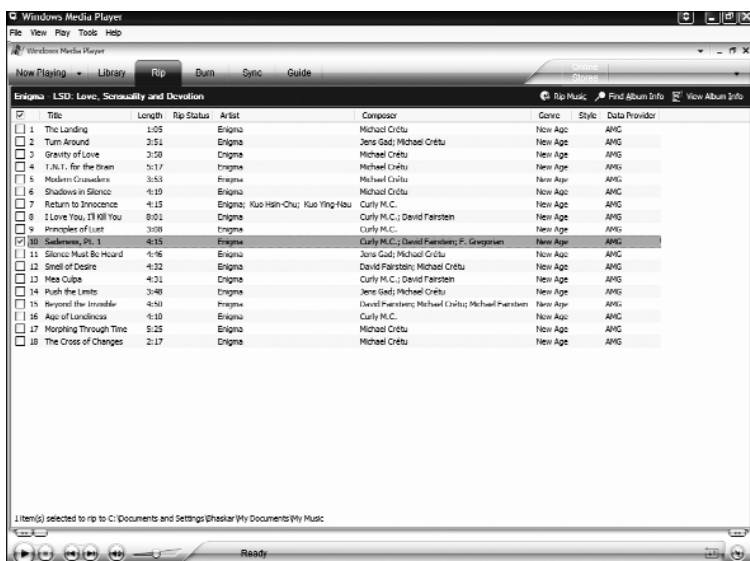
Workshop

In this workshop, we will talk about choosing the best codec for your needs be it for encoding your files or making your own recordings. Although here we are only looking at four major codecs which are MP3, AAC, WMA and Ogg Vorbis (not necessarily in that order). For our experiments, we will take a source file that is an uncompressed PCM .wav file approximately worth 43MB of disk space. Using software that is freely available on the Internet, for instance the LAME MP3 encoder we will encode this file to a smaller size both using lossy and lossless formats and compare these results. So let's get on with it.

Windows Media Player 10

We have chosen this particular version of Windows Media Player since it lets you encode files in the MP3 format too, other than Windows Media Audio.

Windows Media Player does not let you encode .wav files off your hard drive. What you can do is rip music of a CD. Nevertheless,

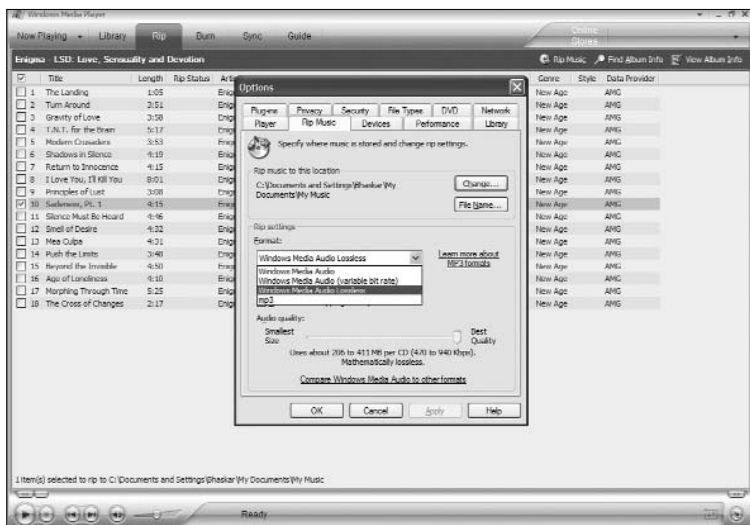


Choosing the song to be ripped in Windows Media Player 10

here is how you can compare your results. First off, rip the song that you want to encode to a .WAV file using a free software such as EAC or dBPowerAmp to your hard drive. Next use Windows Media Player to rip the same song from the CD to a .WMA file and compare the results. The steps below will make this more clearer for you.

In Windows Media Player 10, click on the Rip tab in the default Window or from the Menu Bar, click on View-Go To- Rip. This will take you to the CD track list window.

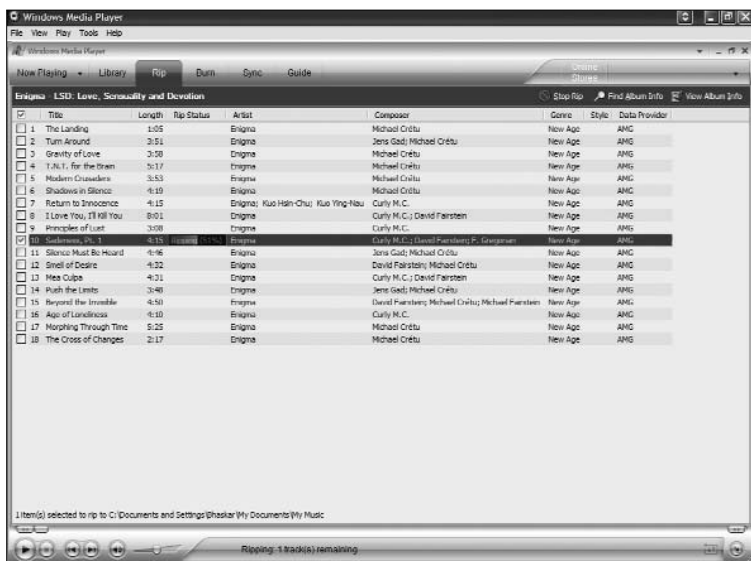
Now click on Tools-Options. This will open a new window. Click on the Rip Music tab in this Window. In the Rip Settings box,



Setting the codec in Windows Media player 10

under the Format drop down list you will see the options available for ripping the track from the CD.

Choose any of the option that you want. If you are of the audiophile kind, the best would obviously mean choosing the Windows Media Lossless. As part of the Microsoft DRM program,



The ripping process

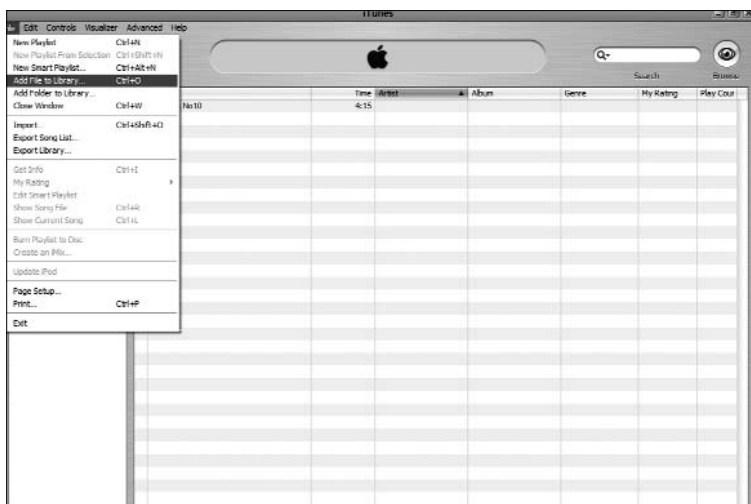
this option lets you choose if you want to copy protect the music. You can check this box if you want. Now, that we are done with the settings lets start with the ripping. For this, just press the Rip Music in the Windows Media Player window.

Lets compare the sizes now. After ripping the song using the lossless codec, the file size 30.1MB is about 11MB lesser than the original .WAV file. What about the sound quality? Much, much better than the regular 128Kbps MP3 file. The average bit rate for this file is 1041Kbps which is much higher than the even the highest MP3 encoding rate which is 320Kbps.

In a similar manner, you can choose MP3 to be the file type of the music that you are ripping in the Rip Music options and rip the song. Our 43MB file in this case is compressed to approximately 10MB file at a bit rate of 320Kbps. Sound quality is good but if you listen really closely, there will be points where you can make out the difference between the original and the compressed files.

AAC

AAC or Advanced Audio Coding is a MPEG-2/MPEG-4 and is the audio codec of choice for Internet, wireless and digital broadcast. This is a good option if you want to stream audio or want your audio to consume a smaller footprint of your total data. AAC encoding is extremely efficient and easily surpasses the MP3 codec and provides surround sound options. The MPEG group that

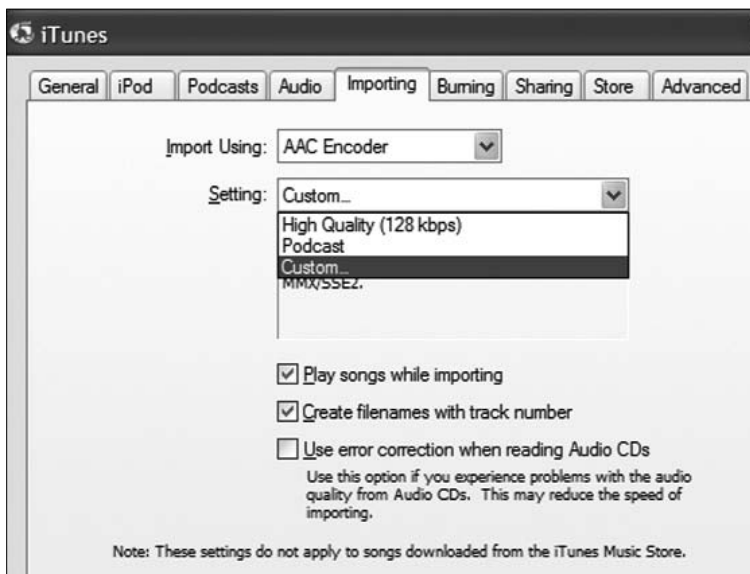


Adding the song to be converted in iTunes

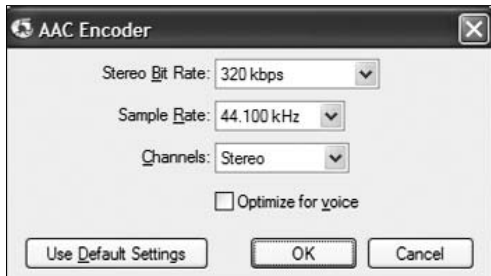
includes Dolby, Fraunhofer (FhG), AT&T, Sony and Nokia developed AAC, top of the line companies, also involved in manufacturing equipment that affects our daily lives.

For converting our .WAV audio file to an AAC file, we will need to use iTunes which is freely downloadable from the Apple web-site. Once you have downloaded and installed the software, follow these instructions to create your AAC file.

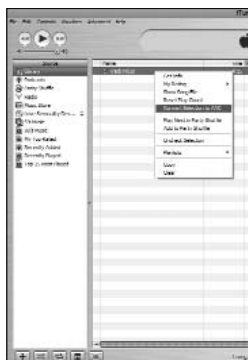
First click on File- Add File to Library, then browse, and locate the file that you want to encode.



Choosing the codec to be used for conversion in iTunes



Setting the codec options in iTunes



Choosing the song to be converted in iTunes

After adding the file, we will need to set the settings for encoding this file. For this go to Edit-Preferences and in the new window that opens click on the Importing Tab. Here you will see that, similar to Windows Media Player, above there are a lot of codec options including Apple Lossless for you to encode your .WAV file with. You will also see a WAV file encoder that will let you encode your Audio CD tracks to WAV files using iTunes. Next, we choose the

AAC Encoder option. By default the option is set to 128Kbps which we will not choose. Click on the drop down list and choose Custom which will pop up a new window asking you to configure the various settings as you like.

Once you are done making the changes, click on OK twice. Now right click on the file that you want to encode to AAC and then click on the Encode to AAC option. This will start the process.

After encoding the file at 320Kbps, the file size is similar to the MP3 file that we made earlier. The sound quality, though, is better than the MP3 file.

Ogg Vorbis

Ogg Vorbis is an open-source audio codec that is still being developed as an answer to both MP3 and AAC. It supports multi-channels and also high bit-rate encoding that rivals the sound quality of any MP3 or for that matter any AAC file. For our workshop, we will use a tiny utility called the oggdropXPdV.



Ogg Drop Interface

This is a tiny (literally) GUI utility that lets you encode your WAV files to Ogg Vorbis format files.

For this simply drag your .WAV files in the fish box as seen in the screenshot to start encoding.

But before we start encoding we will need to set the encoding quality options, that will let us compare it with our previous files. For doing this, simply right click on the Fish icon box and then click on Encoding options. The above image is what you will see.

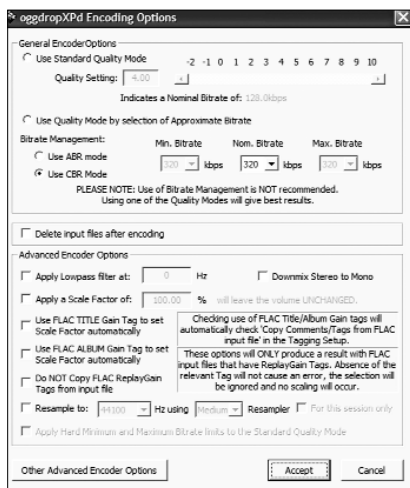
Here click on the radio button under Bitrate Management and choose CBR mode and choose the nominal bitrate as 320Kbps. You

can also go higher, but lets keep it at this to be able to compare the resultant file with the previous files. Now, drag your .WAV file in to the Fish icon box and the encoding process starts.

Even this file is the same file size at 320Kbps. The sound quality is better than MP3 and easily comparable to the AAC file.

This workshop was intended to provide you with a glimpse of what you can do and what options are available for you to use when encoding music. Of course, audio is very subjective and you will need to carry out your own experiments to come up with the best solution for your specific needs.

In this chapter we gave you a glimpse into the world of Digital Audio while in the next, we will delve into the exciting world of video.



Setting the options in Ogg Drop



Converting a song in OggDrop

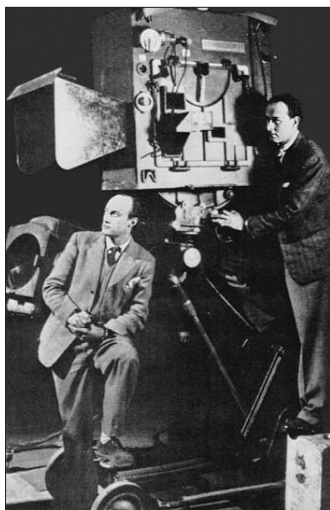
Digital Video



When it comes to digital entertainment, video is perhaps the most important aspect. All of us love movies, music videos and even love to play director with our own home movies. This chapter will give you a better understanding of how to use video as your primary source of leisure and entertainment.

3.1 The Evolution Of Video

The entire concept of video is only a few centuries old and true video broadcasting systems are even younger. Like most other technologies, video has grown immensely in the last couple of decades, from something that only professionals or the rich could afford, to a tool for everyone. Within half a century, we've gone from the marvels of silent movies on the big screen to personal video recording devices that rival the clarity and colour reproduction of big budget production houses.



The movie industry never looked back after the debut of the first full-colour talking movie, *Becky Sharp*, released in 1935. In the 70-odd years since, video has taken over our lives. Today, thanks to a combination of hardware and software that most people can afford, you could sit at home and make a pretty decent home movie, complete with special effects and great editing—the only thing holding you back is your talent and understanding of the magic that is digital video.

The first colour movies were made using cameras that passed light over three different coloured films (red, green and blue-RGB), this was later upgraded to film capable of capturing RGB colours. All this was analogue back then, obviously.

However, even with digital imaging, the basic definition of video remains unchanged: “Many still images being displayed one after another at a very fast rate so as to give the ‘illusion’ of movement.” Basically, whether digital or analogue, video works exactly the same way!

3.2 Basics Of Video

So What Is Video?

Video is nothing but a series of still images, displayed fast, one after the other. Each still image is called a frame, and the rate at which the images are displayed are called a video's frame rate. Since the human eye is only capable of seeing less than 25 different images per second, any video that has a frame rate of 25 frames per second (fps) or more appears to have smooth movement, just as we perceive movement in real life!

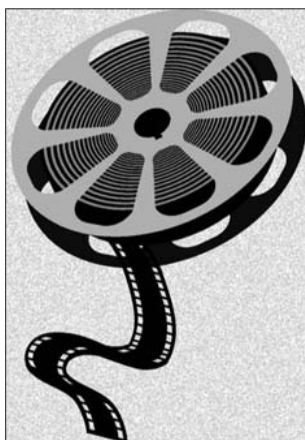
If a video displays less than 25 different frames per second (fps), it appears to be jerky, and our eyes can perceive the breaks in movement.



At 25 fps or faster, however, video always looks realistic and smooth. The standard frame rate for analogue video is 25 fps for PAL (Phase Alternation Line) video, and 30 fps for NTSC (National Television Systems Committee) video. PAL and NTSC are the different kinds of video formats we receive TV signals in. Most countries use the standard PAL video format. NTSC is more prevalent in the US.

What Is Analogue Video?

Analogue video transmits or stores video data in a continuous wave of red green and blue (RGB). The signal is varied using different frequencies of each colour's wave to display changing images at the receiver's end. Since this format involves an unbroken transmission of wave data, it is prone to noise (distortion). However, since this continuous stream of data is very similar to the way we humans perceive the world—our eyes receive a continuous stream of light waves, which our brain perceives as moving images (video)—analogue video data represents reality better.



What Is Digital Video?

Digital video is nothing more than a series of images, all stored in digital format (ones and zeroes) that is displayed in quick succession on a screen (such as a computer monitor).

A digital video recorder, for example, takes analogue signals (light waves) and records them into a digital representation of the analogue data. So almost all digital video is nothing but a computer's understanding of analogue video. There are exceptions, such as in the case of, say, games, where there is no analogue data to begin with, and all the data is created and displayed digitally.



Which Is Better?

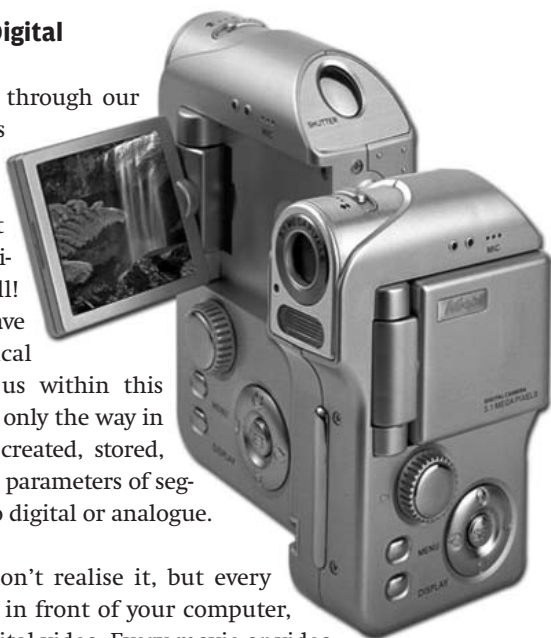
Though there is no perceivable difference between analogue and digital video to the human eye, digital video is preferred because of the ease with which it can be manipulated.

In order to, say, edit a video, or to store it easily, digital format offers a great advantage. You can just open up a software and start editing your digital video, or store hundreds of movies, or movie clips, on your hard drive, or even make copies of your personal videos and share them easily with your friends or family. With computers in our lives, doing all this has become a no-brainer, for most.

With analogue video, you would need to store each video on a videocassette, and making copies of that cassette would involve two videocassette recorders—one playing back the cassette, and another recording the video in real time on to another cassette—which is a very tedious task. With digital video, the same task becomes as easy as copying the video file to another computer or device, or even e-mailing it to hundreds of friends and family members. This is where digital video has the definite upper hand.

Where Do I See Digital Video?

Since we only see through our eyes, and our eyes are analogue video receivers, one could say that you NEVER see digital video at all! However, we'll leave such philosophical thoughts behind us within this book and consider only the way in which videos are created, stored, or displayed as the parameters of segregating them into digital or analogue.



Most people don't realise it, but every second you spend in front of your computer, you are seeing digital video. Every movie or video clip you watch on your computer is digital video; every DVD you pop into the DVD player or DVD-ROM drive is an instance of digital video; the same goes for VCDs, and the MMSes you send and receive; even animated GIF files on the Internet are the same, as are streaming movies or clips. The list is endless.

Even satellite television is transmitted today using digital signals, which are converted to analogue at your cable-provider's premises, before being transmitted to you. Perhaps our only interaction with analogue video today is when watching a movie in a theatre and when watching or recording videos video cassette players or cameras.

How Does A Computer Display Digital Video?

This is perhaps the most basic of questions that all of us want to know. Let's start with how a computer displays data on the monitor:

The Monitor

Let's get to know the computer monitor better first. The most important human interface device in a computer is the monitor, because it is what we humans look at to understand what is currently happening inside our computer system. Even though the computer has no use for text and graphics and works only in terms of ones and zeroes (data), the computer display shows us text and graphics, which our minds are able to understand.

Most of us work with Cathode Ray Tube (CRT) monitors, which are much like the TVs we all have at home. A few of us choose to pay that little extra and opt for Liquid Crystal Display (LCD) monitors (as on laptops).

The words we most often hear when dealing with monitors are “refresh rate” and “resolution”. Here, maximum resolution is the maximum number of dots (pixels) that a monitor can display along its horizontal axis and vertical axis. Thus, a monitor with a maximum resolution of 1024 x 768 can display a maximum of 1024 pixels along its horizontal axis and 768 pixels along its vertical axis.

The refresh rate of a monitor is pretty straightforwardly, the number of times it can draw a whole screen of pixels (1024 horizontal and 768 vertical, in the previous example) per second. So a refresh rate of 85 Hertz (Hz, or number of times per second) at a resolution of 1024 x 768 means that a monitor is drawing the whole screen of 1024 x 768 pixels 85 times per second.

Another term you will come across is wide-screen. In order to explain wide-screen, we first have to talk about aspect ratios:

The aspect ratio of a display is the ratio of the number of horizontal pixels to vertical pixels. The most common aspect ratio is 4:3 for most computer monitors. However, in order to display certain games and most DVD movies optimally, the wide-screen display was made.

Wide-screen displays have an aspect ratio of 16:9. Many people are confused by the difference between 4:3 and 16:9, as at first glance they seem to be the same ratio. A simple math calculation will show you that $4:3 = 1.333$, whereas $16:9 = 1.777$. So it's quite clear that the 16:9 ratio means a much wider screen!

Most computer monitors are analogue display devices.

This means that although

the computer produces digital signals, the monitor

only accepts analogue signals. The monitor connects to the video adapter or graphics card inside the computer to receive analogue signals.



The Graphics Card

This is the device that converts a computer's digital data output stream into analogue, so that the monitor can understand and display correctly. The graphics card receives digital data from the Central Processing Unit (CPU) and Random Access Memory (RAM) inside your computer, converts it all into an analogue signal and then sends the analogue signal to the monitor. This is what you finally see.

Most graphics cards also do advanced graphical computation and take away computing load from your CPU. These involve complex 3D computations that are required by most games of today.



How They Work Together

When you move your mouse, the mouse senses movement and sends the necessary data to the CPU, which in turn, makes sense of the movement and translates that into X (horizontal) and Y (vertical) coordinates. This data is sent to the graphics card or video adapter, which in turn, moves the mouse pointer that's displayed on your screen to the correct co-ordinates. Since this all happens in millionths of a second, when you move your mouse, it appears to move smoothly across your screen, just as if there is a video playing. This is perhaps the most basic for of digital video that you see everyday on your computer!

It's the same basic operation for everything you see on your computer, whether it's moving a mouse, typing on the keyboard and seeing letters appear on your screen, or even watching a movie or playing a game. It's all video, and all digital.

If both monitor and graphics card support digital video inputs and outputs, respectively, you can have digital video all the way from the CPU to the monitor! Of course these are more expensive and rare, but are catching on fast.

Let's move on to the real meat of Digital Entertainment, movies and movie clips that you watch, edit or shoot with the help of your computer! But first, in the next section we'll read a little about Codecs!

3.3 Codecs, Again?

You just read about Codecs in the Digital Audio chapter, but digital video has its very own list of Codecs that help compress videos into manageable sizes.

For those of you who skipped straight to this chapter, the term Codec actually stands for code-decode. A Video Codec is a compression tool that encodes and compresses video data so as to make it more manageable—especially for transfer or broadcast over the Internet. Even for storage, raw (uncompressed) digital video can eat up thousands of mega bytes of your hard disk space.

Codecs step in and code the video data and make it much smaller. However, since these tools (mainly just mathematical algorithms) are used on one computer to encode and compress the file, another computer will need the same tool to decode and decompress the encoded video. This is where Codecs lose in terms of functionality.

Though there are thousands of Codecs available, you will mostly come across only a few. The popularity of these few have ensured that 99 per cent of the video files you find on the Internet have been encoded using one of the Codecs mentioned a little later.

In case you skipped forward here to read about video, please go back and read the Codecs section in the previous chapter on Digital Audio, as Video is made up of both visual and audio components. The audio stream of a video is encoded using an audio Codec, and the video stream using a video Codec. This section only covers video Codecs!

Codecs?

Since all Codecs have one common aim, to reduce file size as much as possible without affecting the quality of a video or audio stream, we will only be looking at the ones that work well here. Also, since the size of a video stream is orders of magnitude larger than its audio stream, compression is even more vital a matter for video Codecs.

DivX

DivX is a video compression format that is used to create and distribute multimedia content. Perhaps the most popular of video Codecs, DivX is used by hundreds of millions of users across the globe to either encode or decode compressed video.

The DivX bundle is available for free download, which includes a DivX movie player and the Codecs necessary to decode videos coded using the DivX algorithm. In order to encode video using the DivX algorithm, you have to purchase the DivX encoder. The freely available download of the decoder is available at <http://www.divx.com/divx/download/>.

XviD

Another popular video Codec today is the XviD Codec. This Codec, unlike DivX, is open source, and all developers are welcome to

help with the project. A lot of movies and video clips available on the Internet are encoded using this Codec.

Currently, skilled video and software engineers from across the world are working on improving this Codec. You can download a Windows binary (installer) from <http://www.xvidmovies.com/Codec/>. If you are looking for the source code for XviD, visit www.xvid.org.

3ivX

Available at www.3ivx.com, this Codec is also popular online. Their 3ivX Filter suite let's you create and play MP4 files. The 3ivX Codecs are also used to encode MOV files, both for the MAC as well as Windows platforms.

Avid

This is another popular Codec that is used quite widely for files available on the Internet. It is developed by Avid Technology, and is available at www.avid.com.



Windows Media Video 9 Series

Abbreviated as WMV9, this Codec now comes inbuilt with Windows Media Player, and gives you great quality encoding, though you will spend a lot more time encoding a video in this format.

However, for making presentations where you need to capture your monitor screen as a video, this Codec is a great help.

You will also find quite a few videos online that use this Codec. Thankfully, there's no Codec download or installation necessary to play files encoded with this Codec.

You can read more about it at <http://www.microsoft.com/windows/windowsmedia/9series/Codecs/video.aspx>



QuickTime

Apple Computer, the maker of Macintosh computers, is well known for building computers and

operating systems with loads of visual appeal. They also have one of the most popular video formats around, especially if it's movie trailers you want to watch online.

We should mention that QuickTime is not a Codec, but actually a player for playing video in the .mov file format. You can still find many tools to convert MPEG or AVI files to MOV files with smaller file sizes using lossless compression.

If you think that this is a lot of Codecs, and things seem to be getting complicated, you should pay a visit to <http://www.fourcc.org/Codecs.php> for an even bigger list of hundreds of Codecs, all of which you may come across when working with or viewing video files. There seems to be no limit to the amount of Codecs out there, and we wouldn't blame you for being overwhelmed by the amount of reading you and downloading you would need to do to get all of these.

Though your media player should automatically download a required Codec when it comes across a video file that uses an unsupported one, this doesn't always work out as well. As a result, if you are a Windows Media Player user, generally, you end up getting a dialog box that says something to the effect of "Codec not found". Thankfully, as is usual, others have had the same problems, and found a solution for you.

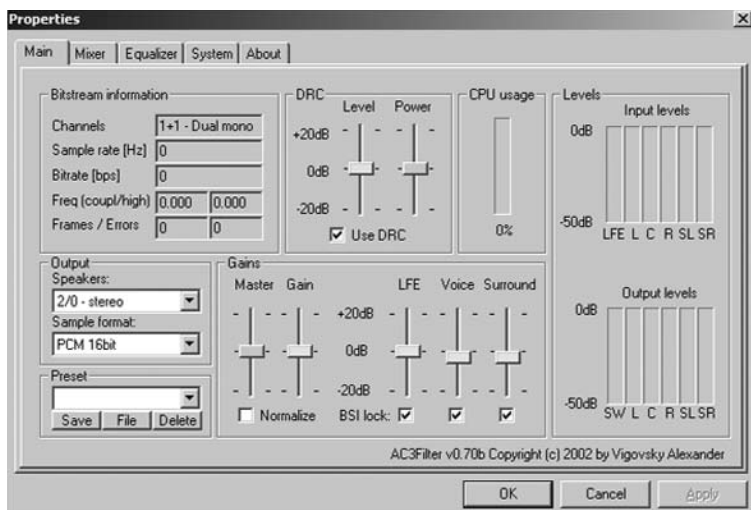
Codec Packs

You can now get what are called Codec packs from the Internet. These packs contain the most commonly used Codecs for video on the Net, and install them all automatically.



KLite Codec Pack

This is a Codec that was popularised by users of KaZaA Lite, the popular peer-to-peer file sharing application. It contains a pretty impressive list of audio and video Codecs.



KLite Mega Codec Pack

This also includes codes for Real Media files and QuickTime files. It is one of the most comprehensive bundle of Codecs available. It was also included in the Digit DVD in August 2005.

Nimo Codec Pack

This Codec pack was popular until recently, and developers only recently stopped updating it. However, it is still an impressive Codec pack for Windows Media Player 9 and 10 users.

A full list of other such Codec packs is available at http://www.free-Codecs.com/Codec_Packs.htm

3.4 DVD

Perhaps the most common form of digital video today is DVD video. A lot of us have DVD players at home, or DVD-ROM or DVD-RW drives that we use to watch DVD movies with. All home theatre systems are based on DVD video quality, and newer technologies such as High Definition Television (HDTV) will allow us to watch movies in even better quality.



The DVD is as good as it gets for personal entertainment currently, and it's necessary that we understand what all that jargon means when talking about DVDs.

Given below is a jargon buster that will demystify a lot of terms and specifications that you will come across, and also help you understand how DVD video works.

DVD: Digital Video Disk / Digital Versatile Disk. This is a media format that can hold between 4.7 GB and 17 GB of data. Physically, it is the same size as a Compact Disc (CD)

DVD-ROM: The first DVD format, or a DVD drive that can read, but cannot write to a DVD disc

DVD-5: Single-layered, single-sided DVDs with a capacity of just under 5 GB (4.7 GB approximately)

DVD-9: Dual-Layered, single-sided DVDs with a capacity of 8.5 GB

DVD-10: Double-sided, single-layered DVDs with a capacity of 9.4 GB

DVD-18: Dual-layered, double-sided DVDs with a capacity of about 18 GB

DVD-R and DVD+R: A DVD disc that can be written to once, the + and - stand for the different formats supported by different DVD manufacturing conglomerates

DVD-RW, DVD+RW: A re-writable disc similar to CD-RWs, where data can be written and then erased and rewritten

DVD-RAM: A now outdated re-writable disc that needs a special hardware recorder. DVD-RAM discs generally come enclosed in plastic cassettes with a sliding opening that gives access to the disc-much like a floppy

Single-layer: A DVD disc that has only one writeable layer per writeable side. Data is “burnt” onto this layer using a laser when storing data

Dual-layer: A DVD disc that has two writeable layers per writeable side, effectively doubling the capacity of the disc as compared to normal single-layer DVDs

DVD-Video: This is the most common usage of DVDs today, and is almost always what people relate the word DVD with. A DVD movie disc is an example of a DVD-Video disc

DVD-Audio: A relatively new form of audio discs that can contain 5.1 channel sound, instead of the normal stereo sound of CDs. These discs contain high definition, high bit-rate audio that has been recorded in true surround (5.1 channel). Though still rare, this format is likely to grow more popular as more audio is recorded for DVD-Audio distribution

DVD Region Code: Every DVD disc can be coded specifically for use only in a particular geographical region. In order to assist this, DVDs can be region coded.

DVD players have a fixed region code that can only be changed a maximum of five times. This region coding is especially used in DVD movies to prevent people from viewing a movie on DVD before it is released in theatres.

For example, say a movie is released on DVD in the US, but has still not even been shown in theatres in India, then without region coding, people would import discs from the US to India and distribute them freely here. This would affect box office sales, and directly hurt the pockets of the movie's producers. There are six regions in total, read on...

DVD Region 1

USA, Canada

DVD Region 2

Greenland, Europe, the Middle East, Egypt, South Africa, Japan

DVD Region 3

Hong Kong, Korea, Taiwan, Philippines, Indonesia

DVD Region 4

South America, Mexico, Australia, New Zealand, Pacific Islands, Caribbean

DVD Region 5

India, Russia, Eastern Europe, Most of Africa, North Korea, Mongolia

DVD Region 6

China

Region Free DVD

In addition to the six regions, there is another symbol you might see on your DVD which symbolises that the DVD does not have region coding, and can be played on a DVD in any zone.



3.5 Movie Lovers

Some of us are a lot more than movie lovers. We are movie maniacs! The reason why there are home theatre systems available that cost as much as a car (and some as much as a small bungalow), is because there are some people with enough money and passion for movies and audio to buy such systems.

When it comes to personal entertainment, nothing beats a great 5.1 home theatre system with a wide flat screen plasma display. It's like being at the movies; but without the irritating cell phones ringing, talkative people, lines, dirty seats and bad food. The fact that you have a pause button for when the phone rings or nature calls is like icing on the cake!

Enough! There's no need to beat this dead horse, we all know how great home theatres can be. We all want one! However, are there any available that suit our needs, or more importantly, our pockets?

3.6 Playing Director

Not all the fun of digital video lies in watching! After all, as the cameras in phones get better, and the market penetration of digital cameras soar, people are fast becoming directors in their own little movie worlds!

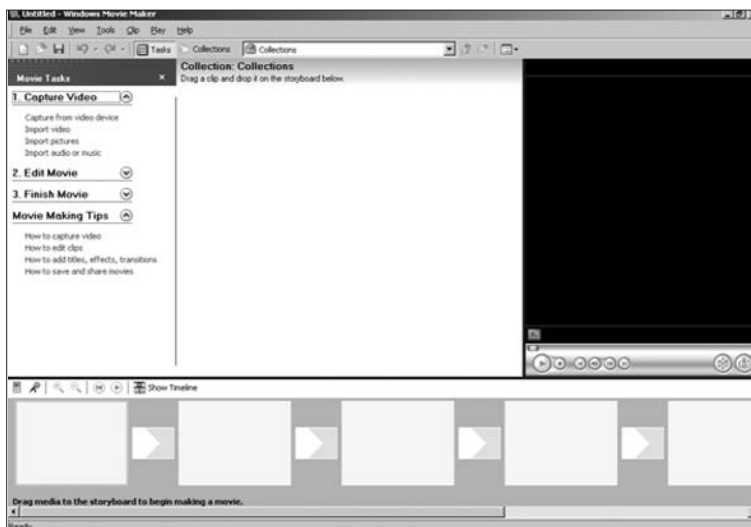
So whether it's making a video CD out of your still photographs, or editing a home-movie that you shot yourself, a digital camera, a PC and a CD-writer is all you need to make your own movie and send it to your friends and family!

A large population of our readers run Windows XP on their systems, and as a result, have Windows Movie Maker pre-installed. Unfortunately, most of us don't realise the power that this little "free" software has. Let's learn more about Movie Maker:

The first step is to get the latest version of Microsoft's Windows Movie Maker from the windows update site. Visit <http://go.microsoft.com/?linkid=3646727> to update your Windows installation and get the latest version of Movie Maker. If you have a decent Internet connection and have Automatic Updates enabled on Windows XP, you probably will not need to update your version of Movie Maker.

Before you begin shooting or editing your movie, you need to make sure you have a decent system, capable of editing video. The minimum recommended system configuration is as follows:

- m 1.5 GHz CPU
- m Windows XP + SP2
- m 256 MB RAM
- m 64 MB video memory with 3D graphics acceleration
- m Support for DirectX 9
- m 4 GB free hard disk space
- m CD-Writer or DVD-Writer drive
- m Sound card + speakers or headphones
- m Internet connection



If your system is underpowered, the editing will still work, but please don't blame *Digit* for the sudden loss of hair or fingernails, brought on by irritatingly long waits and software crashes!

Your graphics card also needs to have an analogue input port (such as an S-Video port, or composite video) if your camera has only an analogue output. For most digital cameras, a FireWire (IEEE 1394) port should suffice. If you plan to use a Webcam, the standard USB connector will do as well.

Of course, all the above is necessary if you are planning on shooting the movie live. If you have already shot the video and have transferred it to your computer, all you have to do is import the movies into Movie Maker from their location on your hard disk and begin splicing them together!

Now that you're all set to make your movie, your first hurdle is where to begin. As with any professional movie, what you need is a storyboard!

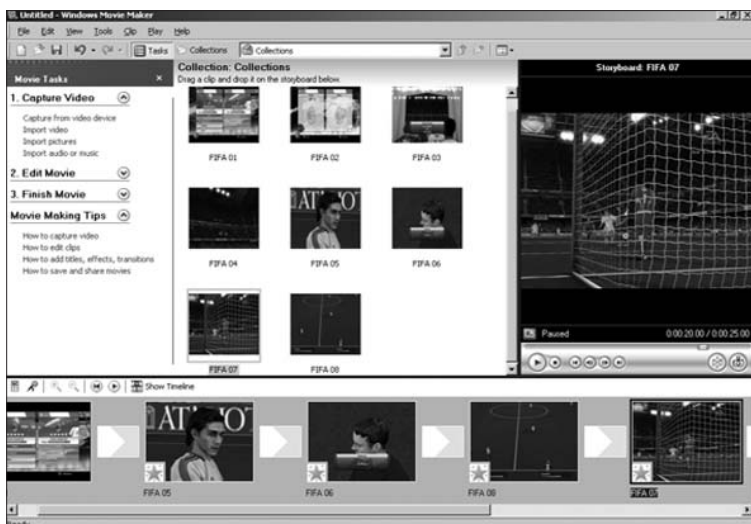
Storyboards

Storyboards are nothing but plans and blueprints of anything. We say anything because you can create a storyboard for a movie, a play, a presentation and even an article—yes we writers do it all the time as well!

The first step when building a storyboard is to import your movies into Movie Maker. When you start Movie Maker, you'll see a column on the extreme left that is called 'Movie Tasks'. Here you see 3 basic steps: "1. Capture Video", "2. Edit Movie", "3. Finish Movie".

Under 'Capture Video', step you will see the "Import Video" link. Click on it and you can choose video files from anywhere on your hard drive. You can also choose to import still images here.

Once the video and image files are imported to the collection, you will see thumbnails of them in the middle column. If you select a file, on the right you will see how it appears in Windows Media Player.



Now you can start dragging and dropping files from the Collection view to the storyboard at the bottom. You can press [Ctrl] + [W] to view the movie as it stands currently.

Editing

In the bottom pane you should see a 'Show Timeline' button. Click on it. You will see the length of each movie clip. Move the blue slider to a position in a clip where you want to cut it, and then drag the edge of the clip to that point. This is how you edit clips to shorten them.

If you want to break a clip up into two parts, just select it in the Timeline view and copy and paste it (using [Ctrl] + [C] and then [Ctrl] + [V]), and then edit the two clips into smaller parts.

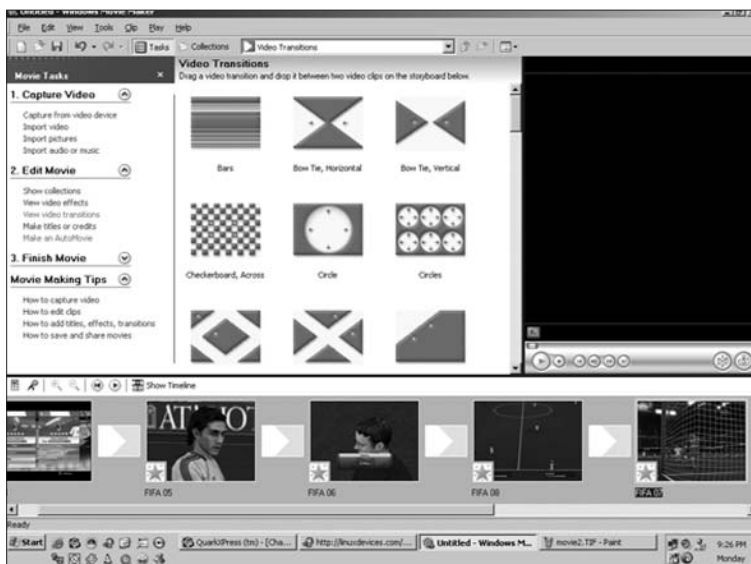
Windows Movie Maker automatically breaks large movie clips into smaller parts, so you should be able to edit them all easily, and even delete a few scenes in the middle.

Effects And Transitions

Once your storyboard is ready and you have edited the clips, you can add Video effects and transitions to them. To add effects, just right-click on a clip in either the Timeline or Storyboard view and choose Video Effects.

Here, you should be able to add from a list of effects on the left. If you just want a simple Fade In or Fade Out effect, right-click on a clip and select either Fade In or Fade Out, instead of clicking on 'Video Effects'.

Transitions are easily achieved from one clip to another, much like it is in Microsoft PowerPoint presentations. Just click on the "Edit Movie" option in the left pane and you should see an option titled "View video transitions". Click on this to get a list of transitions in the middle pane. Double clicking on a transition will preview it in the Media Player pane on the right. To add a transition, just drag and drop it into the timeline view at the appropriate spot.



You need to remember that effects are applied to a clip and transition applied between clips. So a transition will always occur between clips, and not in the middle of one. If you want a transition to occur in the middle of a clip, you will need to split that clip into two separate clips by using the copy + paste method described earlier.

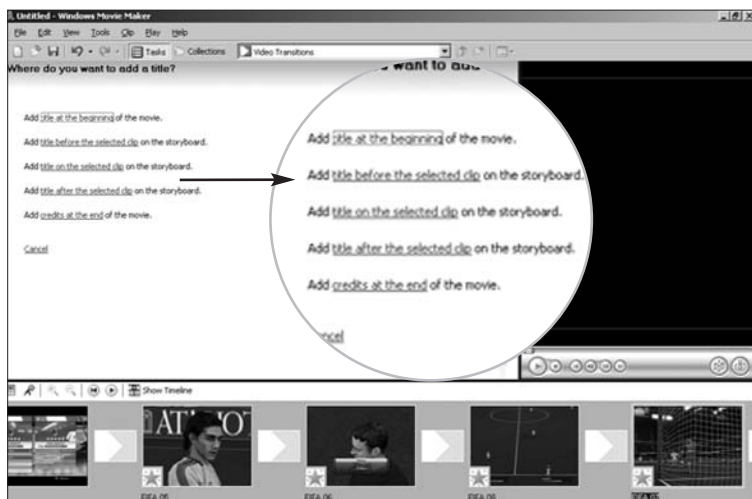
Titles And Credits

Titles and credits can be used at the beginning and end of your movie. You can also overlay text on a clip so that it appears while the clip plays.

In the left pane, under the Edit Movie option, you should see a “Make titles or credits” link. Click on it and you will see the following options:

Add title at the beginning of the movie:

This will add a title to the beginning of the movie, such as introductory statements.



Add title before the selected clip in the timeline:
You can insert titles between clips using this option

Add title on the selected clip in the timeline:
This will overlay the title on the currently selected clip

Add title after the selected clip in the timeline:
You can insert titles between clips using this option

Add credits at the end of the movie:
This is where you are most likely to give yourself credit for making the movie

Select the desired and relevant title, and then click on the “Change the title animation” and “Change the text font and color” to change the setting for the title. You can get loads of animation here, including the classic perspective scroll of text used in the beginning of every Star Wars movie made.

Finally, you should also choose the correct Credits’ animation and font style and colour and then click on ‘Done’.

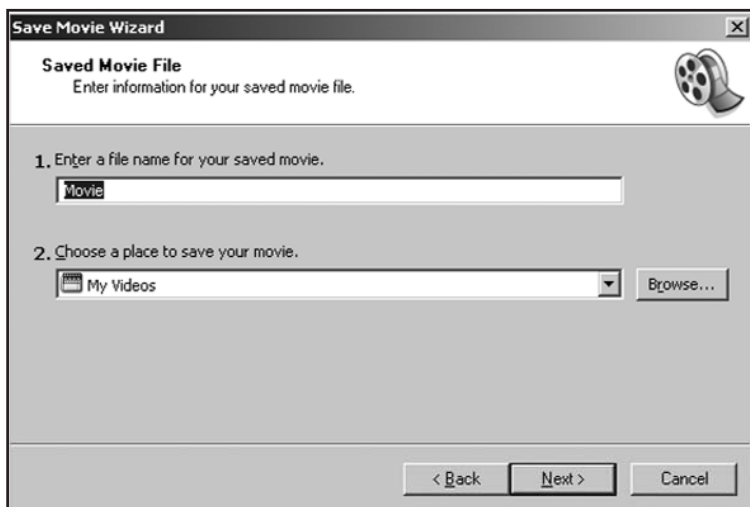
Saving the Movie

Once you are done with everything, you can save your movie by selecting any one of the following, available under the “Finish Movie” option in the left pane:

- m Save to my computer
- m Save to CD
- m Send in e-mail
- m Send to the Web
- m Send to DV camera

These options are self explanatory, and the most common choice will be “Save to my computer” anyway.

And that’s how you can create decent looking movies using Windows Movie Maker. A lot of us at Digit were recently married, and after seeing the power of Windows Movie Maker, are kicking ourselves for paying more than Rs 2,000 each to video photographers for doing what we could have done in Movie Maker ourselves-and done better too!



3.7 Portable Fun

Perhaps the best thing about digital video is the fact that we can store it on portable devices for viewing on the road. Today, the amount of portable devices and gadgets available that can store and playback audio and video is on the rise.

Earlier, we would have to rely on laptops to carry entertainment with us. Though portable audio gadgets have been getting smaller and smaller, video face the problem of requiring a screen for viewing. This puts a limit on the amount that manufacturers can shrink a device, and thus affects portability.

Thankfully, major manufacturers have found a way to offer us just the right mix of portability and viewing comfort, in gadgets such as the iRiver and PDAs.

Yes, even PDAs are capable of storing a full movie or two: the Palm Zire 72 for instance, can store a full 700 MB movie on a 512 MB card, thanks to its Palm Desktop software, which compresses a video by reducing its size to fit the Zire 72's screen. This obviously makes the file about four times smaller, and makes



even this PDA a potential portable movie player. We say potential, because, unless you have a dual-Athlon FX 57 with two 7800's in SLi mode, converting a full length DivX movie for transfer to your Palm will have you staring at your screen for a few hours at least!

Most other PDAs should also offer such functionality, for those of us crazy enough to wait three hours just to have *The Matrix* on our PDAs, to show off to friends!



We would recommend that people who need to have digital video entertainment on the move opt for a device that was made for video. Devices are available from most major brands, such as Archos, iRiver, Creative, Samsung, Viewsonic, etc. Even more devices are appearing in grey markets from manufacturers such as Dream'eo, Odd-i, Technova, MSI, etc.

The recent trend of adding more powerful processors and external memory card support to mobile phones means that we can soon expect to see video on demand services available to cell phone subscribers.

Overall, the most exciting leaps forward are being made in the portable device section, whether it's for digital video or entertainment as a whole. Stay tuned to Digit for the latest in this section as it happens!

The Home Theatre



The movies are set to move from the cinema house into your living rooms. The home theatre experience is becoming a reality in many Indian homes. Here we take a quick glance at what makes that perfect home theatre setup.



Wouldn't it be nice to watch the latest movies in the comfort of your home while still getting the theatre experience? It's not the popcorn we are talking about - something more along the lines of surround sound and the big picture. Home entertainment just seems to be getting bigger and better, what with the advent of flat-screen TVs and DVD players, both of these well within the budget of an average household.

A number of companies offer what they call a home theatre experience. In most cases though, these setups are nothing more than a few speakers bundled with a DVD/VCD player. (The TV remains your existing model.) A real home theatre setup, however, requires more than just wiring up a few speakers and placing them in the four corners of your living room. There is a fair bit of acoustics involved in getting the right home theatre experience - this includes speaker placement and also selection of the size of your screen.

4.1 Stereo, 7.1 And More

Sound systems and speakers have come a long way from the simple phonogram. Today you have a variety of systems to choose from, be it satellite speakers placed in the corner of your room and sub-woofer at the foot of your TV stand, or the elaborate multiple speaker setup that can reproduce each little sound. So moral of the story is that the more the number of satellite speakers you have the better it is, right? Wrong! Though a multiple-satellite-speaker setup will give you richer sound compared to simple stereo speakers, for a true theatre experience it is also important to have a good sound format.

DTS (Digital Theatre Surround) and Dolby Digital are two of the most commonly used sound formats across the world. DTS is a multi-channel surround-sound format used for commercial and consumer applications, that is, in movie halls and home theatre systems. It is primarily used for in-movie sound, both on film and on DVD. The basic and most common version of the format is a 5.1 channel system, supporting five primary speakers and a sub-woofer. However, newer variants currently available support up to nine primary audio channels.

DTS' main competitors are Dolby Digital and SDDS (Sony Digital Dynamic Sound), although only Dolby Digital and DTS are used on DVDs and implemented in home theatre hardware.

Once you have the sound format figured out, it's all about the speaker setup. The most commonly used setup is 5.1. This requires a left, centre and right front speakers, left and right surround speakers, and a subwoofer that produces the bass from all the main channels - or which may only do so for those speakers incapable of doing so. 6.1 channel sound is similar to 5.1, but there is an added centre-rear channel. The number of speakers in a setup can thus be increased for richer sound quality.

It is important to note that the sound channels offered to the speakers may be original, individual channels - or they may decode additional channels from the surround channels.

For the true movie-going experience, however, you'd need surround sound, and stacking up your 5.1-channel sound setup in a cluster is not the way to get it. As per the definition, surround sound is the spatial imaging of sound from one dimension onto two or three dimensions. Surround sound is generated in many ways. The simplest is to use several speakers around the listener to play audio coming from different directions. Another method involves processing the audio using sound localisation techniques to simulate a 3D sound field using headphones. More importantly surround sound is not limited to placement of speakers along a flat (two-dimensional) plane. Vertically-located audio sources should also be considered.

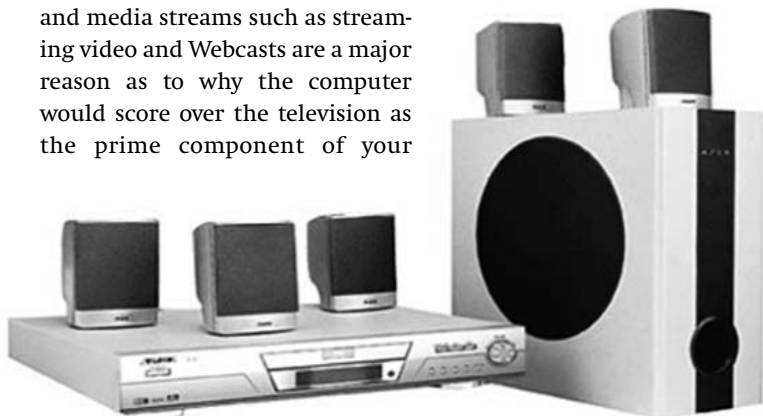
A very common question is, how do additional speakers yield a better home theatre experience? The centre or middle channel ensures that dialogues always seem to be coming directly from the screen. So viewers sitting at the side, too, would feel as if it's emanating from the screen. Your additional speakers at the side relay the ambient sound and the secondary audio, such as the background score. The heart-pounding bass is, of course, courtesy the subwoofer. Once you have a sound idea about the audio setup, it's time to take a look at the big picture.

4.2 Media Wars

In an ideal home theatre, the video aspect usually involves a large-screen or a high-definition television, or a projection system with a movie screen to project the image on.

In most cases, a projection TV is preferred; however, the astronomical cost of the television is the biggest hindrance. Most households substitute the projection or plasma television with their existing CRT television. Another option is to set up your home theatre with your personal computer acting as the media centre. With flat screens and LCD displays available in the market, the computer monitor is no longer a pariah in your entertainment centre. Of course, if you really are in the mood to splurge, you can go in for the 30-inch wide-angle display by Apple - running up expenses is not a very difficult thing!

A decently beefed-up computer can munch through large amounts of data without much trouble. A SoundBlaster card, a mid-level graphics card, and a 5.1 channel sound setup - and you have a decent media centre without going in for those big screen televisions or rear-projection televisions. The fact that your computer can do so much more than just let you watch movies or programmes makes it a very attractive alternative to a complete home theatre setup. Broadband Internet and media streams such as streaming video and Webcasts are a major reason as to why the computer would score over the television as the prime component of your



media centre. You might not get the big-theatre experience while watching a movie on a 17-inch LCD screen, but for everything else, it works just as fine.

Another option in solving the media centre puzzle is the IPTV, or Internet Protocol Television. Revolutions in television broadcast such as TiVo and video-on-demand has pushed IPTV to the forefront and made it a strong contender as the centre of your media hub. It has also made it imperative that you merge your data and entertainment centre. With this merger, you can now watch live and recorded TV broadcasts, movies, browse through a library of digital photos, and stream MP3 music to your audio system - all from a central location. The idea is, in effect, to create a media centre that can store all your data (television programmes, movies etc.), act as your workspace, and also as a home theatre.

Electronics companies are coming up with high definition LCD TVs that can access networks via broadband. These televisions can browse and play data stored on your computer's hard drive - this will give you the necessary freedom to separate your workspace from your entertainment needs.

So would you lean towards a 17-inch LCD or CRT monitor, a stand alone 29-inch television, or a projection TV - or would it be the new age IPTV? As of today, in India, with broadband technology yet to get to the end user and with the cable television industry unregulated, it is best to de-link your workspace from your entertainment centre. A TV with network access capabilities and one that can directly access your hard disk via a home network seems to fit the bill quite well. This ensures that the big screen television can be used in one room while you work on a presentation on your computer and yet watch movies stored on your hard disk on the big screen TV when it catches your fancy.

That is what we call the perfect media hub. Of course there's a price you'll pay, and we are talking hard cash. How much?

4.3 Let's Talk About Money, Baby!

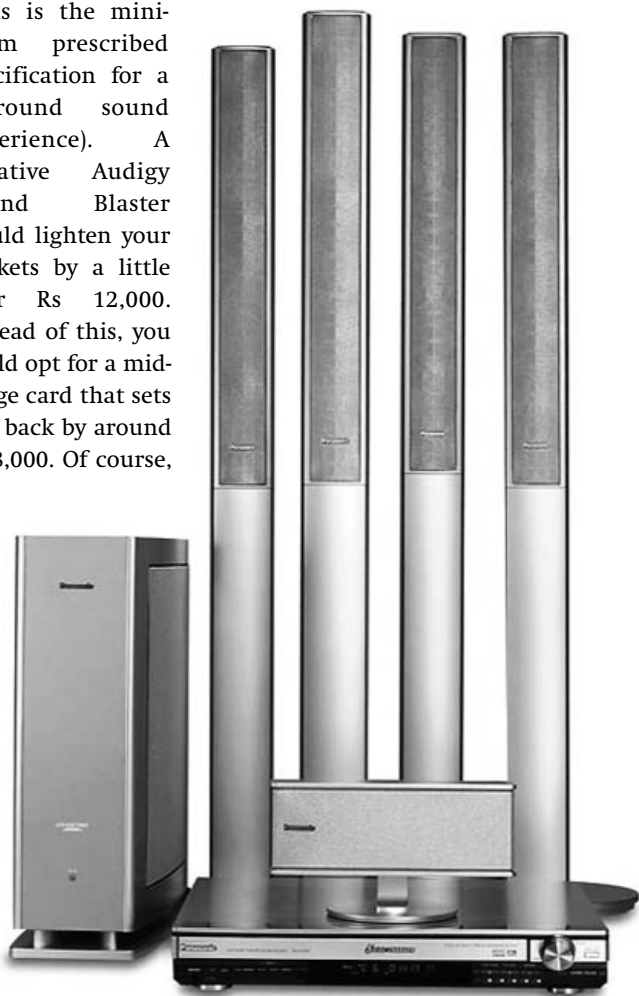


Costs of consumer electronics are falling everyday. New discounts and lower prices are making high-end televisions and audio equipment accessible to the common man. DVD players which, until a few years ago, cost well over Rs 10,000 are now available for less than half that price. So is your home theatre soon going to be a reality?

To get a grip on the real price of an entire home theatre setup, we need to scratch below the surface and all the marketing gimmicks. The first task is to identify a true-blue home theatre system. A set of five speakers and a DVD player coupled with your existing television is what masquerades as a home theatre in most cases. As mentioned earlier, the sound format and your TV or any other viewing platform are two of the vital elements in your home cinema experience. Now let us assume two scenarios, one with the computer as your media hub and the other with the television.

For your personal computer to double up as a television you would need a TV tuner card. These cards are relatively cheap and a good quality card would cost you around Rs 3,000. In addition to this you would also need a good sound card that can handle 5.1-channel sound.

(This is the minimum prescribed specification for a surround sound experience). A Creative Audigy Sound Blaster would lighten your pockets by a little over Rs 12,000. Instead of this, you could opt for a mid-range card that sets you back by around Rs 8,000. Of course,



to get the surround sound you would also need to install a 5.1 channel speaker system.

A good quality speaker would cost you a little over Rs 5,000. Of course, we're assuming you wouldn't want to watch movies on a 14-inch or 15-inch CRT. For an okay-ish movie experience you would need a 17-inch screen. That would put you back by Rs 6,000. If you are in a mood to splurge, you can go in for a 19-inch or 21-inch LCD display - and don't get us started on the 30-inch wide-angle display by Apple.

A DVD player is a necessity, and most computers today are equipped with a DVD drive. So the total cost of setting up a media hub with your PC as its centre would put you back by around Rs 25,000. You would get a decent enough viewing experience with the above-mentioned system, but don't expect that 70mm feel. For that you would have to shift from your study to your living room.

A home theatre with the television as the centrepiece is what most people look for. A 29-inch television, a DVD player and a surround sound system. The entire setup could easily put you back by Rs 35,000 or 40,000. If you go in for a rear-projection television or plasma screen, then you push the price into six figures, but that would ensure you'd never miss the big picture.

4.4 The Final Cut

If you're not a movie buff and watch one only over the weekends or occasionally, then we'd suggest you just rig up the audio setup to your existing television or even your computer, provided you have at least a 17-inch monitor.

Think about it: do you really want a wide-screen TV and surround sound for those daily soaps? Someone in your household might, and thinking a little rationally will save you a lot of trouble. On the other hand, if movies are a daily diet and you have tonnes of cash to blow, then go ahead and splurge.

Go in for a 52-inch monster and blast the living daylights out of your neighbours with a 7.1-channel sound system.

For your first home theatre, though, we'd suggest you rein in your aspirations and play it safe. Go in for a mid-range system that would make sure the five-day test match and the latest Spielberg film are given their due.

Games People Play



Gaming is not only a big industry today, it is also considered the ultimate pastime by many. But what really is it all about? What are various formats and what's the best gaming experience? We examine the options.



5.1 You Should Know...

5.11 Gaming Today

Games... where would we be without them? In a relatively short span of time, gaming has revolutionized our lives. It has grown from being a simple tool to pass our free time to a worldwide phenomenon. The video game industry itself is estimated to be worth \$10 billion per year. Believe it or not, this is more than what even Hollywood rakes in!

One of the paradigm shifts to have taken place here over the last few years has also seen games appeal to a wider audience and not just teenagers. In countries like the US, gaming has even become a career option with players such as "Fatal1ty" making a good living by winning some tournaments. Make no mistake: Gaming today is serious business.

5.12 Gaming Lingo and its Meaning

Like anything else related to computers, gaming has its own unique parlance. Here are some of the most commonly used words and their meanings:

1) FPS

a) First Person Shooter; which refers to the genre of game. For e.g.: Doom 3, Half Life 2 b) Frames Per Second; which refers to the number of frames displayed on the screen per second. Higher the number of frames, the smoother the performance.

2) RPG

Role Playing Game; which refers to the genre of game. E.g., Star Wars Knights Of The Old Republic, The Elder Scrolls III: Morrowind.

3) MMORPG

Massively Multiplayer Online Role Playing Game; a relatively new entrant into the gaming arena, it's quickly gaining popularity with games like World Of Warcraft and Ragnarok.

4) Frag

One kill. Thus, the player with the highest 'frags' in Doom 3 is the one who killed the most demons.

5) Boss

Refers to a special type of enemy who is tougher to beat and usually appears towards the end of the level.

6) Camper

Refers to a person who stays hidden during a multiplayer game, and waits for people to come to him before attacking. Used in a derogatory sense.

7) Newbie

Inexperienced player. Again, not used in a good way!

8) NPC

Non Player Character. They are part of the game but controlled by the computer.

9) AI

Artificial Intelligence.

10) Cut-scenes

Small cinematic scenes that are thrown in during the game to liven things up.

5.2 PC or Console?

Ever since the PC became a potent gaming device, one question has haunted all gamers: PC or Console? Both have their pros and cons, not to mention a dedicated fan base. Let's take a look at the positives and negatives of each.

5.21 PC's Rule...

PC's are very popular for gaming. The biggest positive is that its uses are not restricted simply to games. You can use a PC for a million other things like browsing the web, creating and viewing documents, spreadsheets, presentations, or to listen to music, watch movies and so on.

At the same time, for people who only enjoy simple online games, PC is the only solution. In India, PC hardware is relatively easy to find, and PC games are available a dime-a-dozen. Further, if something goes wrong (which it invariably does) it is easy to locate a technician who can solve your problem in a jiffy.

Another, often overlooked point is the use of a keyboard and mouse. Since we have been using them all our lives, some people



find it is much easier to play games with them, as opposed to a console where one has to first get used to a gamepad. Multiplayer online gaming is another big positive for PCs. All you need is a legitimate copy of the game and a decent Internet connection and you're good to go.

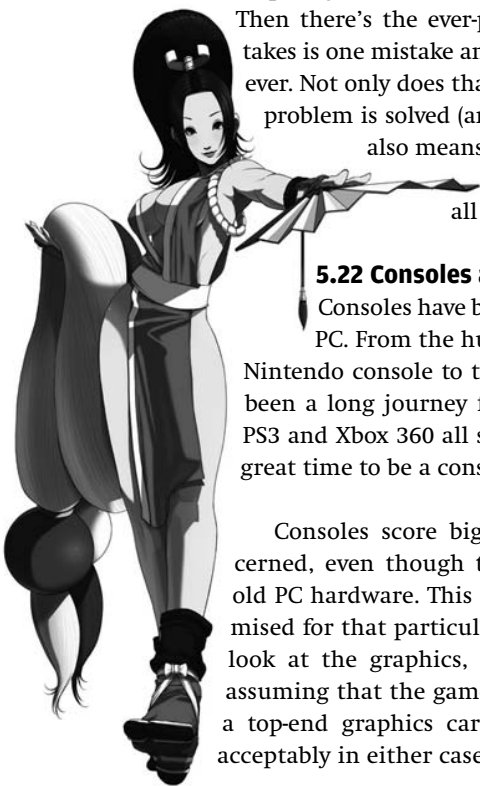
Nothing in life is perfect though, and the PC is no exception. The biggest drawback of the PC is the fact that one needs to upgrade the hardware on a regular basis to play the newer games. With newer games pushing the envelope in terms of sheer power, often the low and mid-range systems can't keep up. Thus, to stay contemporary one needs a bank account the size of London!

Then there's the ever-present problem of viruses. All it takes is one mistake and your computer could be lost forever. Not only does that mean giving up games until the problem is solved (an appalling suggestion in itself), it also means that if you've not backed up your game's 'save' files, you will lose all your progress (major bummer).

5.22 Consoles are not bad either

Consoles have been around much longer than the PC. From the humble beginnings of the very first Nintendo console to the ultra-modern PS2 or Xbox, it's been a long journey for the gaming devices. With the PS3 and Xbox 360 all set to rock the world, it really is a great time to be a console gamer.

Consoles score big points where hardware is concerned, even though they effectively run on relatively old PC hardware. This is because all the games are optimised for that particular piece of hardware. If we take a look at the graphics, e.g., a PC game has to be built assuming that the gamer could be using either a low- or a top-end graphics card, and the game must perform acceptably in either case.



For a console, however, the hardware is always constant and thus the games look good enough to drool over without any issues like poor frame-rate. At the same time, this also means that there is no need to constantly upgrade the hardware, which allows you to save big bucks.

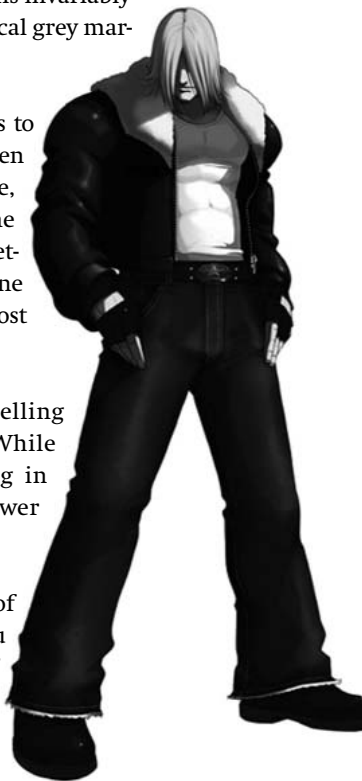
Further, consoles have traditionally been given preferential treatment over PCs, hence many games are either released exclusively for consoles (FIFA Street, Star Wars Episode 3) or are released on consoles months before they are released for the PC (GTA: San Andreas)

Sadly, consoles are not easily available in India. PS2 is the only console which is officially available and this invariably forces the true enthusiast to turn to the local grey market to get anything else.

The paucity of consoles naturally leads to a shortage of games, legal or illegal. And even if you were to find the game of your choice, sky-high prices are sure to send you home empty handed. Online gaming is a major let-down since you need to pay to join an online gaming service such as Xbox Live, and most of these services are not available in India.

As you can see, one can make a compelling case for both the PC and the console. While the jury is still out on console gaming in India, there is no doubt about its power and 'game-friendliness'.

If you want a machine that is a jack of all trades, the PC is your best choice. If you want a hardcore gaming machine-lack of legally available hardware and software notwithstanding-there is no doubt that the console is what you are looking for.



5.3 PC: Getting the Hardware Right

PC gaming is all about having the right hardware. It can be the difference between having a good time and having a great time. And thanks to some cut-throat competition we're spoilt for choice! With prices falling constantly, buying a gaming rig no longer requires a pocket deep enough to fit a Grand Canyon. Let's see what type of hardware you need to look at, as a gamer.

5.31 Know your PC

Today, most games utilize almost every piece of hardware on your PC. From the motherboard to the soundcard, maybe even your Ethernet card! Let's take a look at the important components.

Processor

The most basic piece of equipment you will find in your computer is the processor. Quite literally it's the brain of the computer, and can do calculations at the speed of light. Processors have come a long way from the early days of the 486 systems. Gone are the days when 133 MHz processors were called blazingly fast. Today processors have breached the 3.0 GHz mark and show no signs of stopping. And that's not even taking into account 64-bit processors which are even faster!

In a game, the processor plays a major role. There are thousands of calculations and computations that need to be done every second. For e.g. Every movement you make and how it affects the environment around you, your interaction with the environment, the behavior of the AI and so on. All of this is done by the processor. Naturally a faster processor is very helpful, but its effectiveness depends on the rest of the hardware too.

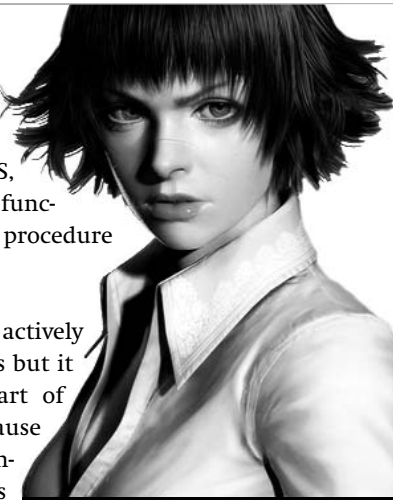
Motherboard

The motherboard is like a switchboard at a telephone exchange. It connects the various hardware components. Every component is either directly or indirectly connected to it. It has a number of slots where you can plug in your hardware. These slots can either be of the PCI, PCI-E, AGP or IDE variety, apart from which you also

have the memory slots for your RAM. A motherboard also has a chipset, which is its logic system, and the BIOS, which performs certain basic functions such as the boot-up procedure before the OS kicks in.

The motherboard is not actively involved in any computations but it still forms an important part of your gaming PC. This is because every other component is connected to it. Therefore it is necessary to have a good motherboard with support for fast

RAM, plenty of slots for upgrades, enough USB and/or firewire ports for external peripherals and so on.



High quality visuals demand high quality hardware for the best experience

RAM

RAM stands for Random Access Memory. Like the name suggests, it is a storehouse for memory. However what makes your RAM unique is the fact that data stored on it is not permanent. It is only stored as long as the program using the RAM requires it. Think of it as the short-term memory of the computer. You only keep information there as long as you need it, after which it is either forgotten or stored in the long-term memory.

RAM comes in a variety of sizes, speeds and standards. Today 1 GB RAM on a single chip is very common, as are speeds of 677-800 MHz that are found on the latest chips. For gaming, at least 256 MB of RAM, running at 333 MHz is required for smooth gameplay.

3D Accelerator

The 3D accelerator is the component which renders all of your video. It can be of 2 types- 1) onboard, which is a part of the motherboard itself and uses a part of RAM as memory or 2) A stand-

alone card, which plugs in to your motherboard and has its own memory, BIOS and Graphics Processing Unit or GPU. The old 3D cards used to connect to your motherboard via a PCI slot, but advances in technology meant that the data transfer rate that the slot allowed became too slow. This led to the creation of the

AGP or Advanced Graphics Port. Today even AGP stands on the threshold of extinction, with PCI-E or PCI Express quickly becoming the favoured standard. Further, the newest developments have allowed user to buy two, yes two 3D cards and harness the power of both at the same time to give greater performance. This feature, known popularly as SLi graphics, is being offered by both the major players in the 3D accelerator business—nVidia and ATI.



Once again the equation is pretty simple— the better your graphics card, the better your visual performance. Your requirement is governed by the types of games you play. Thus, for e.g., someone who only plays the latest FPS games will require a cutting edge 3D card with the best features, but if Pac-Man is your thing then onboard graphics more than meet your requirements.

Sound

Until a few years ago, sound was probably the most ignored aspect of gaming. While everyone went gaga over the graphics of a game, sound would remain largely ignored. Things have changed though. With developers putting more and more thought and effort into the sound of the game, speakers and soundcards have become an integral part of a gamers hardware. The most



commonly used surround sound speakers are of the 5.1 variety, which has 1 centre speaker, 2 main speakers and 2 surround speakers. The .1 denotes the sub-woofer, which is a separate unit. Choices are virtually unlimited however. From the traditional 2-speaker stereo systems to the cutting edge 7.1 surround sound systems there is something for everyone.

To enjoy the top-end sound systems, you will probably require a good sound card. Having said that, onboard sound is not too bad either. Just like 3D accelerators, motherboards come with onboard sound. In fact a top-end motherboard may even offer you features

What To Buy

	Basic Gaming machine	Powerful but affordable gaming PC	The best system money can buy
You Need	A simple inexpensive machine that lets you play a few of your favourite games, performance doesn't really matter	A machine that gives you the flexibility to play the demanding games, without going bankrupt to pay for it	The best of the best. Money is of no concern.
You Should Buy	Processor: AMD Athlon64 3200+ RAM: 512 MB Transcend Graphic Card: NA Motherboard: MSI RS480M2	Processor: AMD Athlon64 3800+ RAM: 512 MB Transcend Graphic Card: XFX 6600GT Motherboard: ASUS A8N SLI Deluxe	Processor: AMD Athlon X2 3800+ RAM: 1 GB Transcend Graphic Card: XFX 7800 GTX Motherboard: ASUS A8N SLI Deluxe

to rival any soundcard. This includes support for multi-speaker, surround sound systems. Soundcards however remain a popular choice for gamers. They provide top-quality sound, with support for the latest speaker systems and conform to most, if not all the quality standards such as THX and Dolby Digital. Creative are the most popular manufacturers of sound cards today.

The right speaker-sound combination for you depends what you will use the two for. For e.g., if you play the occasional 2-D game and listen to some music, a 2 speaker setup with onboard sound is more than sufficient. But if you want to play the latest games and experience mind-numbingly realistic surround sound then the 7.1 speaker system and a top-end soundcard is what the doctor ordered!

5.32 Decisions, Decisions!

Now that you know all about the hardware involved in gaming, you're probably wondering which components best suit your needs. Although having unlimited choice is a great thing for any buyer, it can be a bit daunting to make a final decision. But fear not! We are here to solve your dilemma. Deciding which hardware to buy is as simple as glancing at the table "*What to Buy*"!



5.4 Consoles: Which one's right?

A console is a dedicated gaming machine. Every gamer dreams of having one. Consoles today are scaled down versions of your average PC. How do they perform so well, you ask? That's because all the games which are made for consoles are optimized for that particular piece of hardware, unlike PC games that have to be able to work with a wide range of hardware. For e.g. the game Halo for Xbox was optimized to work with its hardware and therefore gave stunning performance. Halo for the PC however, had to be able to work with low-end, average, as well as upper-end machines. Thus the performance of the game was not exactly stellar (no pun intended!) on the lower and average systems.

The main players in the console business are Sony and Microsoft with their respective consoles, The Playstation 2 and the Xbox. Nintendo were once top of the pile when it came to

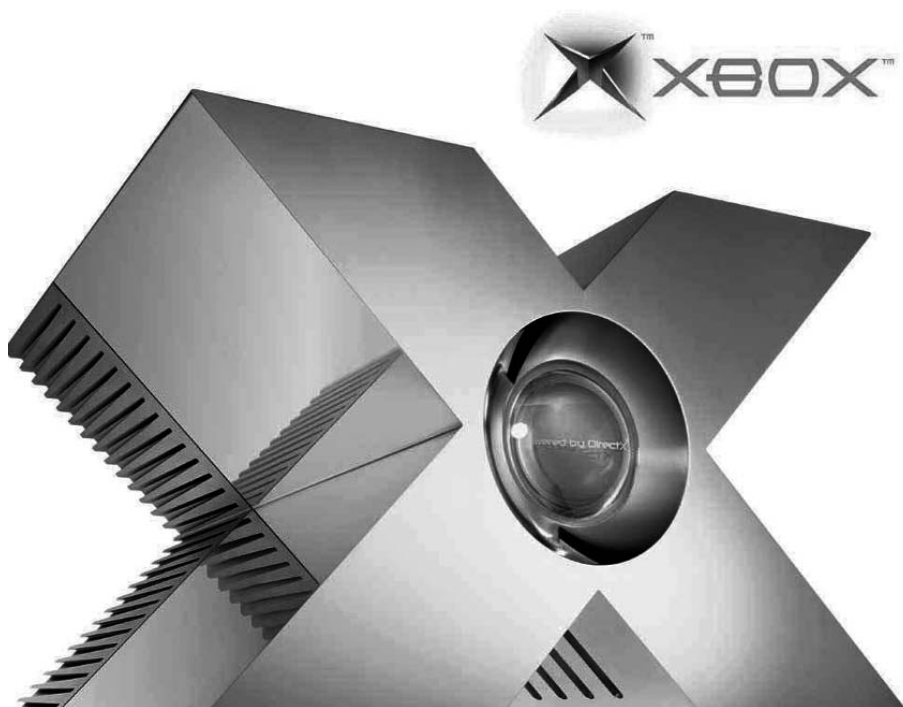
consoles, but even their new GameCube has been overshadowed by the two giants—PS2 and Xbox. While there isn't much to choose between the big two abroad, living in India does change the equation. Here is how the two consoles compare to each other.

The Playstation 2

The Playstation 2 is the most popular console in the world today. And it's easy to see why. With the original Playstation Sony captured the world's imagination, all they had to do with the PS2 was iron out the creases. The PS2 also happens to be the only console to be officially launched in India which means easy availability of the console and its games, at least in the metros. While the number of games available may not be as high as its PC counterpart, the major ones are easy enough to find. They cost a bombshell when compared to PC games though, which explains the popularity of the PS2 mod chip that allows users to play pirated games. Be warned though, this is illegal and nullifies the warranty of the PS2. One excellent feature offered by the PS2 is backward compatibility which means that all of your PS1 games will work with the PS2, giving it the largest game library of all the consoles. Another nifty feature is full support for DVD's, with support for surround sound systems via a Digital Out (Optical) connector along with a Dolby Digital/DTS certification.

The Xbox

The Xbox was pretty much a darkhorse when it first came out. It was attempting to infiltrate a market already dominated by Sony and Nintendo. Today it is a well-established console, fighting with the PS2 for supremacy. It has quite a few things going for it; for starters it's the fastest console of the lot. But what really sets it apart from the competition is the superior graphical power. It blew the competition away on that front. Unfortunately though, availability in India is an issue since it was never officially launched here. This means you'll have to go the black market way to get your hands on one. Further, getting games for the Xbox will be even more difficult due to lack of demand as compared to the PS2. This is bad news because the



number of games available for the Xbox is not spectacular to begin with, and it's nowhere near the PS2. Annoyingly, Microsoft decided to make it mandatory to buy a DVD movie playback kit to enable DVD movie support. This only allows the PS2 to zoom ahead of its rival.

...And the winner is

Quite simply, the PS2 is the best console out there for Indian gamers. The easy availability of the console, an unparalleled game library and built-in support for DVD's as well as surround sound make it the clear winner. Bear in mind though, that the next generation of consoles will be coming out soon, so it may be prudent to hold on for awhile, more on that a little later. But if you want a console today, then the PS2 is the best one out there.

5.5 Games, Games, Games!

Now that you know all about PCs and consoles, it's time to get down to the serious business of playing games! The bread and butter of every gamer, games too have advanced by light years

over the last two decades. From the good-old days of 2-D Pac-Man to the ultra-real 3-D environments of Doom 3, there really is something for everyone, whether you enjoy a quiet game of chess or if frantic fragging is your thing. Here's a look at the world of games.

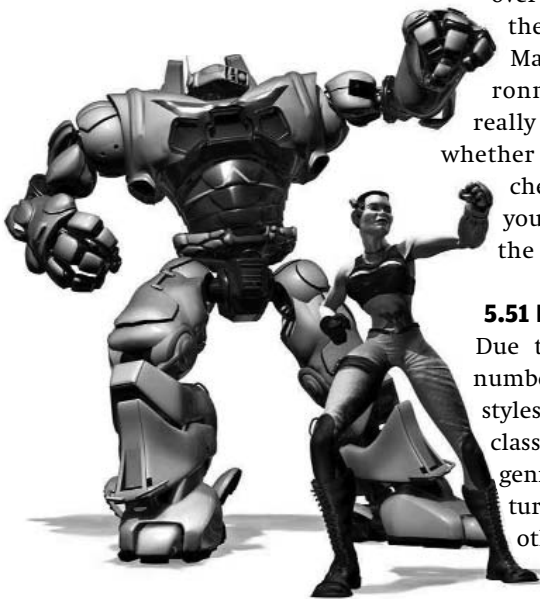
5.51 Do the Genre thing

Due to the emergence of large numbers of games and gaming styles, it becomes necessary to classify them into genres. Each genre has its own distinctive features that set it apart from the others, although some games may borrow features from

more than 1 genre. Basically the popular genres are-

1) First Person Shooter

Also known as FPS, it is arguably the most popular genre of gaming today. FPS' place the gamer behind the weapon, only letting you see the hand of your character. This gives the gamer a first-person view of events and effectively simulates the feeling of being there. FPS games are fast paced and action based, requiring quick reflexes and good aim. The genre was made popular in the early 90's by games like Wolfenstein and Doom. Today games like Halo, Half-Life 2, Doom 3 and Far Cry are the biggest names in this genre.



2) Sports

Sports games aim to realistically simulate a real-life sport on your PC/console. Every major sport today has at least 1 game based on it. These games may or may not require quick reaction times, depending on the sport in question (for e.g. a game like golf doesn't require quick reflexes but a game like soccer does) Further some basic knowledge of the sport is necessary to play the game. FIFA 2005, Cricket 2005, Fight Night 2 and Top Spin are some of the big names in this genre.

3) Racing

Another popular genre, it places you behind the wheel of a fast paced car, and pits you against a number of opponents in a simple race. Gone are the days however of simple circuit racing. Today developers are adding more and more different styles to spice things up. For e.g. the drag and drift modes found in the latest edition of Need For Speed, and the hot pursuit mode found in Need for Speed: Hot Pursuit and Need for Speed: Hot Pursuit 2. The most popular games in this genre are the Need For Speed series, the Gran Turismo series and the Project Gotham Racing series.

4) Strategy

These games require careful planning and strategizing to win. Thus in simple words, strategy games make you use your brain! The games can be of two types, turn based or real time. Originally turn based strategy games were more popular, with games like Sid Meier's Civilizations becoming huge hits and acquiring a cult following. Today however, most games are real-time strategy based. Of the real-time games, most are war-based and focus heavily on the military combat and tactics. The most popular games in this genre include StarCraft, WarCraft, Age Of Empires and Command And Conquer

5) Simulator

Simulator games try to accurately simulate a real-life situation, down to the last detail. For e.g. a flight simulator would simulate

a real-life plane so accurately that it could be used to teach flying! Naturally having such detail and realism makes the game almost impossible to play without first reading the manual and/or practicing a lot. Microsoft Flight Simulator, Falcon 4.0 and IL2-Sturmovik are some of the popular games in this genre.

6) Role Playing Games

Also referred to as RPGs, they usually place you in a fantasy universe, where the game moves forward based on the players interaction with his environment. Further each character is given a particular set of skills, which he can improve as the game progresses. Popular RPGs include Diablo, Final Fantasy and the Star Wars: Knights Of The Old Republic series.

MMORPGs have arisen in recent times as an offshoot of RPGs. These are online games where thousands of players can interact with each other in the same virtual world. Most of them are subscription based and are available only in specific areas. EverQuest, World Of Warcraft, The Matrix Online and Ragnarok are popular MMORPGs

Keep in mind though, that these are only broad generalizations. Some games borrow heavily from more than 1 genre, and some cannot even be placed into any genre. A gamer's personal choices also play a part here, therefore making it next to impossible to definitively mark out and define the various genres.

5.52 Online Games

Ever since the advent of broadband internet, online gaming has become very popular. No matter how good the Artificial Intelligence (AI) of a game is, it can never match up to a human mind. Thus online gaming has become the ultimate arena for gamers around the world. It has become an arena where modern day gladiators learn the tricks of the trade and master their skills.

Online gaming really took off when broadband internet became a reality for most people. This allowed smooth gameplay,

without any lag, i.e. delay in time between your input and its actual in-game effect. But this was only half the reason for spectacular success of online gaming. The other half was good, even addictive.

A game like Half-Life: Counterstrike was revolutionary when it came to online multi-player games. It helped popularize the very idea of competing against a human player over the internet. Many updates and a sequel later, Counterstrike (or CS as it is called) remains among the most popular online games today.

Although virtually every game today comes with the option of online play, very few have been able to make an impact on the gaming world. One such game however is Battlefield. Battlefield became the second generation of online games. Games up until then had pitted a maximum of 10-15 players against each other in simple weapon-based combat. Battlefield up the ante and increased the number of players per map to hundreds.

Further, it added ground and air vehicles that could be used by the players. This gave it the feel of a real war, making it an instant hit with gamers around the world. Today Battlefield, along with its sequels, is arguably the most popular online game in the world. Looking at the future, it would seem that MMORPGs are the going to be the trendsetters. Already gaining popularity all over the world, games like World Of Warcraft are enticing more and more people everyday. India too is not far behind, with Ragnarok being offered to *desi* gamers.

They say that the internet has something for everyone, and this certainly holds true for games as well. So if you are just a casual gamer who enjoys simple, easy to understand and use games then the internet has plenty to offer. Simple, usually flash-based and supremely addictive, these are games for the masses.

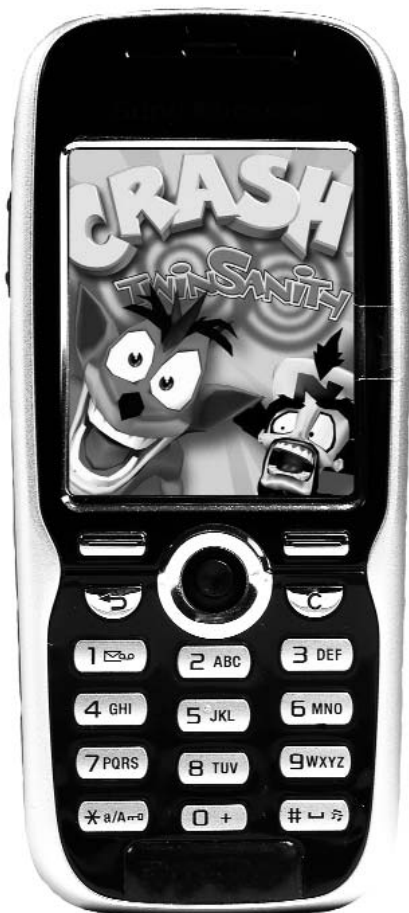
Whether you're at the office getting bored or at home with nothing better to do, they're the best way to pass time and have fun doing it. From the classics (chess, checkers, mah-jongg, su-

doku) to the sporty (stick cricket, BMX star, Kingpin Bowling) to the absolutely ludicrous (Kill Harry potter, Punch the President, Stop Cockroach Chris, Parking Perfection) any and every type of game can be found online. Once you've had a taste of these, you'll keep coming back for more! <http://mousebreaker.com/> and <http://i-am-bored.com> are two great sites for such games.

5.53 Mobile Games

With the recent boom in mobile telephony in India, it was only a matter of time before mobile game fever hit the generation next. The newest branch of the gaming industry, mobile gaming is estimated to be worth about \$1.5 bn. As a concept, mobile gaming is slowly but surely taking over the world and India is certainly no exception. According to *infotech.indiatimes.com*, over eight million mobile games are downloaded every year in India which range from Rs. 15 to Rs. 150 per game.

As would be expected, games that are cricket based are the most popular, followed by Bollywood, Hollywood and racing games. Not only do mobile





games offer the player a chance to pit his wits against the AI of the game it also allows him to play against other humans via Bluetooth, if supported by the game. Further, 3D gaming for mobiles is starting to gain momentum; quite a few of the blockbuster PC and console titles like Splinter Cell and Prince Of Persia are also available for mobiles.

The mobile manufacturers themselves have helped in popularizing the concept of mobile gaming. Nokia has been marketing its gaming phone the N-Gage QD quite aggressively, and has even held a tournament for the same! With such enthusiasm from all parties involved, one can safely say that the future for mobile gaming is very bright indeed!

5.6 Gazing Into the Crystal Ball...

So what does the future hold for gaming? Well, the possibilities are limitless. Games are a dime-a-dozen and there are always a couple of good games around the block. PC hardware too is always being improved upon, with faster, bigger, more powerful components being announced everyday. As the joke goes- The rate of advancements is so fast that your hardware might turn obsolete as you read this!

Consoles are where things get interesting. All the major players in the console business have recently revealed their next-gen consoles, sparking off the so-called 'console wars'. Microsoft with their Xbox 360 and Sony with their Playstation 3 are going to be the major players in the industry, with Nintendo and it's Revolution having to be satisfied with a bit-part role.

Apart from the good looks, it's the hardware specs for each system that has captured the imagination of gamers worldwide. And it's not difficult to see why. The Xbox 360 has a CPU with three IBM PowerPC 3.2Ghz cores, ATI 500MHz graphics processor, 48 billion shader operations per second, 512Mb GDDR3 RAM of memory, Removable and upgradeable 20Gb hard drive, Three USB ports and support for DVD-video, DVD-ROM, DVD-R, DVD+R, CD-DA, CD-R, WMA CD, MP3 CD, Jpeg photo CD. Overall, Microsoft claims this will give a teraflop of performance.

That's quite a package and literally the stuff gaming dreams are made of. What really has everyone drooling though is the Playstation 3. It gives you a CPU Cell Processor running at 3.2 GHz with 7 special purpose 3.2 GHz processors, capable of 218, count them, 218 gigaflops of performance, Backward compatible, GPU RSX at 550MHz 1.8 teraflop floating point performance, 256Mb XDR main RAM at 3.2 GHz, 256Mb of GDDR VRAM at 700Mhz, Memory Stick Duo, SD, compact flash memory slots, Detachable 2.5 inch hard drive, Support for seven Bluetooth controllers, Six USB slots for peripherals, Supports Blu-ray DVD format, System

Floating Point Performance of 2 teraflops, Communication Ethernet, Wi-Fi IEEE 802.11, Bluetooth, Output in HDTV resolution up to 1080p as standard. According to Sony, the PS3 will be 35 times faster than the current Playstation, the PS2

Although it would appear that the PS3 has a clear edge on the 360, this may not necessarily be true. Microsoft argues that Specs are irrelevant if you don't have the tools to support developers. The two consoles are very evenly matched in all other aspects. Both have a number of games being developed for them already and both will be released within months of each other- the 360 is out in Christmas and the PS3 in spring 2006. So basically what all this means is, very soon it's going to be a great time to be a gamer!

Ready to frag?

Mobile Entertainment



Entertainment is increasingly going mobile. The mobile Entertainment industry is in a nascent stage, and much of what we're seeing now could seem quaint just a few years from now. In this chapter, we provide some key insights into the phenomenon.

6.1 Mobile Entertainment: Challenges and Possibilities

Karenza Moore and Jason Rutter of the University Of Manchester, England, provide some insights into this subject.

The mobile phone can be thought of as a key cultural artefact in modern social life. Mobile phones have become mundane, everyday devices that have been quickly integrated into routine practices. However, despite their perceived mundane and 'pedestrian' nature, technological development means that they also represent a significant face of cutting-edge digital entertainment. Mobile entertainment, it is hoped, will drive the sales of new handsets and increase service provider revenues as people use the data networks to send photographs, play games, find a nearby restaurant or get cinema listings with their phones. Here we concentrate on the consumer side of the mobile entertainment equation.

Despite considerable enthusiasm within the mobile sector with regards mobile entertainment (often described as the 'saviour' of the industry), it is not yet entirely clear whether mobile entertainment will become as indispensable for consumers as mobile communication has become.

Mobile Entertainment: European Facts and Figures

Penetration:

In 2003, 70 per cent of Europeans used a mobile phone. Mobile penetration in Europe grew from 53 per cent of the population in 2000 to 66 per cent in 2002.

Saturation:

Some analysts maintain that the saturation point has been reached in most Western nations. Mobile subscriber levels are predicted to stagnate at around the 300 million mark in Europe for the foreseeable future.

Upgrade:

If mobile entertainment is to be widely used in Europe, consumers must be prepared to upgrade their handsets. In markets with high penetration rates such as Italy, the UK and Germany, there is evidence that upgrading is occurring but not necessarily as regularly as operators and manufacturers would hope.

Phones and PDAs:

European member states vary in the type and number of 'Web-enabled mobile devices'. In Europe mobiles are the most likely devices for mobile entertainment applications. No country (Bulgaria excluded) is expected to have more than 20 per cent of its Web-enabled devices in PDA, laptop or console form.

Age:

There is a pervasive assumption that it will be teenagers that drive the mobile entertainment market. This results in a concentration on young people within research into mobile entertainment.

73 per cent of children aged 10-17 surveyed by Accenture used mobile phones, but while the majority thought that gaming was one of the key functions of the phone, 91 per cent described current games as 'poor' or 'average'.

Age is a significant factor in SMS usage although it is not clear whether this will translate into MMS usage. It is predicted that by 2006, 15-19 year olds will constitute the bulk of MMS in the larger markets.

Age is also thought to be a significant factor in mobile gaming demographics. A recent IN-FUSIO/Orange market survey of 600 existing Orange France customers with ExEn-enabled handsets revealed that 78 per cent of players were less than 25 years of age, and 92 per cent under 34 years.

Gender:

Further investigation is needed to explore the possible similarities and differences between the genders in terms of mobile entertainment usage patterns, particularly as these demographic details could be used by the European mobile entertainment industry to better adapt and target their products to end-user needs.

In terms of SMS, females are more likely to rate SMS as a more important service than males, whilst males are more likely to rate WAP as an important service. It remains questionable whether a simple extrapolation of such gender differences to provide indicators for EMS and MMS usage in the near future is wise.

The INFUSIO study indicated of the customers surveyed who played mobile games 56 per cent were male and 44 per cent female. This is a similar gender split to that of the PC/console games market.

Mobile Entertainment: SMS and MMS

It seems probable that full multimedia MMS is unlikely to take off in the youth market as a tool for everyday communication in the near future. However, it does seem possible that it will be popular for event-driven communication and marketing such as for birthdays, holidays and so forth.

Users tend to perceive SMS as cheaper and often more convenient than voice. However, the upgraded functionality of colour, audio and graphics may not entice users to shift to MMS for as long as the initial cost of MMS and related compliant devices remains high. For the majority of messages, multimedia is seen as adding little or no value for additional cost and complexity.

Mobile Entertainment: WAP and the 3G Challenge

The difficulties which faced the end-user with regards WAP - including dropped calls, slow response rates and low quality and choice of content—meant that services were largely deemed a fail-

ure in the European market. Despite high hopes for 3G services, consumer scepticism may still prove to be a sticking point for the industry. 61 per cent of 6,000 mobile phone owners surveyed in 15 countries, including the UK and the USA, were aware of third-generation services, but only 29 per cent planned to upgrade to a 3G network.

Over 70 per cent of respondents maintained that they had yet to access the Internet over their phones because they did not understand the total 'user experience'. It is expected that an assimilation gap will develop, meaning that the use of 3G services will be notably lower than the penetration rate of 3G phones.

Mobile Entertainment: Mobile Gaming

Mobile gaming is a nascent market. While mobile users are relatively familiar with embedded games such as Snake the concept of wireless gaming is a little less well established. However, will consumers actually be willing to pay to play on their mobiles? A recent survey by research firm Schema found that 35 per cent of gamers they surveyed thought it unlikely that they would play games on a mobile phone. Studies demonstrate that mobile gaming will have to cope more with a lack of time as a barrier to play in addition to the price or even quality of games. Dips in weekday WAP traffic patterns during morning rush hour challenge the assumption that users access mobile services during 'downtime' when travelling.

If consumers have more time to play at home than while on the move then mobile games will be in competition with any 'static' gaming platforms the consumer may have in his or her home.

However, the mobile communication device is one technological artefact that is likely to remain constantly with a user (unlike a GameBoy Advance for example). The mobile gaming industry will have to exploit mobile devices' convenience, personalisation and localisation (through games that tap into location-based information and communication for example).

Mobile Entertainment: Consumer Issues

The implementation and success of mobile entertainment products, business models, technologies and content relies ultimately on the creation and ongoing development of a solid end-user market. Secure, transparent, and reliable billing and micro-billing systems for mobile entertainment products and services must be implemented as swiftly and as effectively as possible.

Finally, mobile entertainment must, above all, be entertaining (and to a certain extent ‘useful’) to the consumer. Without sufficient understanding of the social contexts in which mobile entertainment is embedded it is unlikely that consumers will come to think of mobile entertainment products and services as significant components of leisure practices.

6.2 Phones As All-In-Ones

The Sony Ericsson W600 and W800i are examples of ‘Walkman’ type mobile phones—in fact, the W800i is called the ‘W800i Walkman’. These are examples of phones that are trying to be all-in-one devices, with the music features being not just add-on functionalities but part of the selling point of the phone. Is this the beginning of a trend?

The W600

According to geekzone.com, “With the W600, consumers can handle phone calls while listening to digital music, capture quality megapixel images and video, experience 3D game play as well as access the Internet and e-mail. The W600 is the second in a series of Walkman phones that deliver an open-standard-based digital music player for the mass market combined with a wide variety of features.

“It is a tri-band (850/1800/1900 MHz) GSM/GPRS phone (class 10), with support for EDGE networks. The phone comes packaged with Disc2Phone PC software that enables transfer of music onto the phone via a PC. Accessing music on the handset is quick and easy via a direct music buttons that control the media player or play, pause and stop music tracks, and the Sony Ericsson W600 comes with quality headphones and built-in stereo speakers.



“The W600 handles multiple file formats including MP3 and AAC. Using PC software from Sony CONNECT, downloaded songs and songs copied from CDs can be transferred to the W600. Users can browse, sort, find, transfer and delete music files. The W600 can store up to ten full length CDs or between 80 and 120 songs depending on bit rate on 256 MB RAM.

“Sony Ericsson says the phone can play music for up to 15 hours with the phone on, or 30 hours with the phone in music mode, where the radio is not operating.

“The W600 supports Bluetooth wireless functionality to easily connect other Bluetooth enabled devices such as photo printers and headsets or for peer-to-peer gaming. USB plug and play allows consumers to move images, music, and video easily between a PC and the W600.

“It can also be used as a digital camera, with a 1.3 megapixel camera (4x digital zoom) for image stills and video recording, plus picture light. The screen is a 1.8-inch (176 x 220 pixels) 262K colour display.

Games can be played in both vertical and horizontal (portrait and landscape) mode. The phone offers an enhanced gaming experience via a 3D graphic engine making game play fast and smooth. A five-way navigation key and dedicated A/B gaming buttons provides the feel of traditional gaming.

The MMC-60 Music Cable can connect the W600 to a stereo Hi-Fi, and the HCA-60 Advanced Car hands-free kit allows music to be played through a car's speakers.

The W600 will be available in the American Market at beginning of the fourth quarter 2005.”

The W800i

Mobile-phones-uk.org.uk rates the W800i as “outstanding”. The review goes on to say: “The W800i is Sony Ericsson’s first mobile phone to be Walkman branded. The clear message is that this is both a phone and an MP3 player.

“The specification of the W800i is the same as the K750i, except that the W800i is customised for music. There’s a one-touch music button for controlling the MP3 player, plus extra bundled software for ripping audio tracks from CDs. The W800i also comes with a larger memory stick for storing all those songs—512 Mbytes may not sound a lot when compared with an iPod (or even an iPod Mini), but it’s pretty large for a phone, and is enough for around 150 audio tracks. The memory stick is expandable to 1 Gbyte. A quality headset is included in the sales package, and the W800i can also be connected to an external speaker system via an optional cable.

“Apart from these changes, the W800i has all the features of the K750i: a two-megapixel camera and auto-focus, a video camera, FM radio, Bluetooth and tri-band. It’s an excellent all-round media device—quite possibly the best at the time of writing!”



6.3 Mobile TV

On 26 November 2004, Nokia welcomed the announcement by the European Telecommunications Standards Institute (ETSI) that DVB-H (Digital Video Broadcast—Handheld) is to be adopted as the standard in Europe for mobile TV services.

DVB-H is a new technology that enables the simultaneous transmission of multiple television, radio and video channels to mobile handheld devices. It combines traditional broadcasting standards with specific features for handheld devices. To receive DVB-H transmissions, handsets require an additional integrated receiver. Nokia plans to bring a commercial mobile TV handset with integrated DVB-H to market globally in 2006.

“This announcement is an important step forward in making commercial mobile TV services a reality,” said Richard Sharp, Vice President, Rich Media, Nokia. “DVB-H is a groundbreaking technology that will facilitate the widespread adoption of mobile TV around the world. We are delighted that ETSI has adopted the DVB-H standard for Europe and started the trend for the global adoption of DVB-H.”

Mobile TV presents a number of unique challenges, such as battery-powered receivers and a variety of situations of use (e.g. indoor, outdoor, pedestrian, inside moving vehicle). DVB-H provides the most efficient way of carrying multimedia services over digital terrestrial broadcasting networks to handheld terminals.

To overcome these challenges, DVB-H uses a variety of techniques including time-slicing to reduce a device’s average power consumption, cell identifiers to support quicker signal scan and frequency handover as well as methods to improve signal strength in the mobile environment. The technical specification work has been done in the Digital Video Broadcasting Project (DVB), which is an industry-led consortium committed to designing global standards for the global delivery of digital television and data services.

DVB-H technology is being piloted in the United States by Crown Castle and Nokia. The pilot has started in the Pittsburgh, PA, area and it aims to prove and test the feasibility of DVB-H technology and related service systems in the United States.

ETSI is responsible for the standardisation of information and communication technologies within Europe. It is made up of manufacturers, network operators, administrators, service providers, research bodies and users. Their acceptance of DVB-H as the standard for mobile TV paves the way for people to receive television-like content through a mobile phone.

An August 3, 2005, report by Techworld said the following about DVB-H:

“As if phones didn’t already have enough features, within the next few years, the mobile industry is going to add another major one: broadcast TV. The service will be consumer-led, but could there be other applications for business? The leading standard for mobile TV, DVB-H (Digital Video Broadcasting—Handhelds), has emerged from Nokia and been standardised by the European standards group ETSI, as EN 302 304.

DVB-H means building a new radio receiver into the handset, tuned to whatever spectrum is going to be used for mobile video broadcasting. It sends 15 Mbit/s of data per 8MHz channel, and adds error correction to compensate for possible poor reception.

Nokia has created DVB-H handsets—basically its 7710 device with an add-on radio module. Integrated DVB-H devices are due next year. Other handset makers including Samsung have prototypes and are expected to follow suit.

At first DVB-H will only be in expensive handsets. As time passes, it will become cheaper, until the DVB-H capability costs as little as adding an FM radio receiver.

DVB-H trials, in Helsinki, Oxford and about fifteen other places, have focussed on consumer services, in which users pay between 5 and 15 for up to 20 TV channels.

In the US, Pittsburgh has a trial service provided by Crown Castle, which has a nationwide licence for spectrum at 1.5GHz.

Mobile phones bring several benefits for a service like mobile TV. Firstly, they are in users' pockets already, so vendors don't have to sell a whole new device. Secondly, they can use the cellular network as a communications channel for services like interactive TV. And finally, because users are already paying a mobile bill, it is easy to bill them for extra services, and users will (operators hope) be willing to pay to see TV on their mobile.

Alternatively, some services may be free-to-air, supported by adverts. The broadcast and mobile industries will be jockeying for position as they get together in this new example of convergence.

There are currently no bands set aside for DVB-H broadcasting. However, in the short term, the technology is similar enough to DAB (digital audio broadcasting) to use DAB bands. In the long term, the bandwidth dividend when analogue TV broadcasts are shut down (around 2012) will provide more than enough spectrum for broadcast to mobiles.

As operators scent money, licences for spectrum that can be used for DVB-H may be auctioned, and prices could be high. However, the UK is unlikely to see a repeat of the "3G auction" of 2000, for at least one reason. Ofcom has become technology neutral, and will want to sell spectrum without requiring any particular use.

Mobile phone users can already see TV programs on their handsets if they want to. For instance, Orange's MobiTV system broadcasts CNN and ITV news over the 3G network, to users with the Nokia 6680 handset. However, using a two-way data network

for broadcast data is wasteful and does not scale well. MobiTV is on a free trial at the moment, but the actual cost will be \$15, for a limited time (24 hours viewing per week). Other competition includes Qualcomm's MediaFlo, which the company is hoping to get off the ground.

In Korea, services exist using DMB (digital multimedia broadcast) and there are proposals for S-DMB (satellite digital multimedia broadcast), which would use a terrestrial repeater network to relay signals from satellites. DVB-H promoters label DMB as being too close to DAB. Designed for video, DVB-H gives more data per channel, say its backers.

Broadcasting to handsets could be very useful for information such as traffic and weather reports, or even warnings and emergency information. Like other broadcast services, it may also be possible to piggyback other data on it, perhaps including software upgrades for mobile devices, or updates to customer or product databases in devices carried by mobile workers.

More On DVB-H

DVB-H is the technology driving mobile TV. A combination of conventional digital video and IP, DVB-H scales for smaller devices a technology that's already in place in millions of TV sets worldwide.

Digital Video Broadcasting—Terrestrial (DVB-T), the current standard in digital video broadcasting, wasn't designed for mobile devices. However, as antenna technology improved, DVB-T mobile services became feasible, leading to extensive commercial trials. Digital TV reception on the move is an exciting advance in broadcasting.

However, handheld devices simply don't have the battery life to make DVB-T reception a viable option for consumers. A new solution was needed, DVB-H, or Digital Video Broadcast—Handheld, is that solution.

In addition to a great reduction of battery power consumption, DVB-H had other major requirements: maximum compatibility with DVB-T systems and networks, as well as the ability to receive 15Mbit/s in an 8 MHz channel and in a wide area single frequency network at high speed.

DVB-H is the best delivery system currently available for most markets, for the following main reasons:

- An approved standard since November 2004 for handheld equipment by ETSI (European Telecommunications Institute) with a high adoption rate worldwide
- It benefits from existing DVB-T infrastructure components, which reduces initial investments
- It provides the best user experience in the mobile environment, with an energy-saving handset that is only 'on' 10 per cent of the time, programme guide, soft handover and in-building coverage
- It offers an excellent, broadcast-quality picture, because the screen resolution is of a similar standard to VHS
- Battery consumption is reduced by 90 per cent due to time-slicing technology
- Efficient use of bandwidth enables up to 55 mobile channels plus scalability

It will be accessible by an audience of approximately 300 million mobile users by 2006.

6.4 Mobile Gaming: Business Perspectives

Mobile computer games have their history in Nintendo's portable LCD game series "Games & Watch". These games became very popular in the 1980s. These simple miniature consoles introduced a concept of keeping a small source of digitised entertainment in the pocket—constantly available. There were nearly 70 different kind of LCD games⁴. In this series, Nintendo also introduced its most know game character, Mario, as well as brought licensing into active use with using Disney's characters in their games.

In 1990s, Nintendo's markets became more and more competitive with multiple competing LCD game manufactures and thus it introduced a new kind of game consoles—the Gameboy console with changeable game cartridges. The device became the dominant one in the markets and marks currently nearly a synonym for portable game consoles. Nintendo with its partners has launched hundreds of game titles for the device and its more advanced successors.

Wireless gaming (games on mobile phones) emerged with Nokia's launch of the Snake game in 1997. The simple Snake game became surprisingly popular and Nokia brought additional titles to their devices. Simple mobile phone games, similar to the original Snake, are played on small breaks to provide relaxation and a small escape from routines. These games were originally installed permanently on the phones, but nowadays more and more they can be purchased through the mobile networks.

In the end of the 1990s, Japanese success of I-Mode network based games created a boom for WAP-games—games that mobile phone users would use through their WAP-browsers in the phones. In Europe, Nokia's 7100-series of phones were the first ones capable for this activity. The slow connection speeds made these games a very disappointing experience and thus they never reached the mainstream markets. Yet, some SMS-based games have gained popularity, especially when supported with television broadcasting.

In 2001, the introduction of downloadable games and colour screens on mobile devices has brought wireless games into mass markets. Suddenly, consumers were willing to start purchasing small chunks of entertainment to broaden their game selections on the mobile devices. In addition, mobile phones are constantly developing towards small microcomputers—smartphones and thus game play is nowadays much richer than the simple Snake-like-gaming used to be. 3D-graphics and natural sounds are entering also wireless games.

Nokia has continued to pioneer in the field of wireless gaming. In 2003, it introduced its N-Gage game deck and wireless online gaming with N-gage Arena. This device is a full-scale game console with changeable cartridges and smartphone functionalities. In addition, the N-Gage started a new era in online gaming—the device and some of its game titles are linked into a game server via GPRS networks and thus enable group games in an online community. Furthermore, N-Gage has Bluetooth gaming functionalities for short-range (~ 10 m) group games. The N-Gage launch was carried out with large scale. Yet, there are still no guarantees of business success of the device. Nevertheless, the N-Gage has created increasing interest towards mobile games and Nokia's competitors (e.g. Sony) are also planning on similar activities in the handheld game device markets.

The gaming business (including PC, console and mobile games) is currently evaluated to total \$20 billion. Mobile game business comprises approximately 0.9 billion euros—5 per cent of the total game markets. Yet, the growth rates within this area are forecasted to be very strong. Analyst predictions on the total future volume of mobile game business vary from one analyst to another.

Strategy Analytics predicted that the mobile game market would grow to \$7 billion by 2008. The ARC Group forecast that number of worldwide mobile game users will grow from 196 million in 2002 to 667 million in 2005. Informa Media Group has stated the mobile games segment of the video games industry would comprise

11.7 per cent by 2006. With no clear agreement on the total amount of the expected turnover, most of the industry players have anyway indicated that business is growing faster than expected. E.g. German mobile portal Jamba has reported 300,000 Java application downloads/month out of which 80 per cent are games. Mobile game business has a very short business cycle. A typical game title is valid for the market and sells well approximately 6-12 months dependant on its geographic distribution range. In addition, the mass markets for mobile game titles are very global. A company aiming to gain major revenues in the markets has to find methods and activities to bring its products for the main markets, such as Japan, USA and Korea. This may become a major obstacle for a small company starting its operations in the mobile game business. The small company needs to find strong distribution partners to help it in its efforts. In addition, a game developer has to find means to localise their productions to the key markets in the most efficient manner.

The initial price for a mobile game has been relatively low, around 2 to 7 euros per game. Multiple early adaptors in the game business are testing and buying mobile games at this price. The only exception in the game pricing has been the N-Gage cartridges priced to 20-40 euros per title. Yet, these are much broader and more complex games than the compact downloadable games from the operators' networks.

When consumers are getting used to purchasing mobile games it is clear that the demand for games' quality will increase. Players are expecting the service provider to guarantee that the value of the purchase matches the price paid for it. If there will be a lot of disappointments, the industry may be harmed by inflating reputation. It is important to price games according to their perceived value. Older games should be cheaper than new titles, e.g. launch of new FIFA Football mobile 2005 would immediately decrease the price of FIFA 2004 game at a mobile portal.

Currently the most sold game genres among the consumers have mostly been action driven games (space, shooting, sports and

especially racing). When mobile games increase in popularity among consumers other kind of game solutions will appear. An interesting development area in this is location-based gaming, i.e. games that combine players locations (identified by mobile networks or GPS satellites) and actual game play.

Major technological developments

From a technological perspective the mobile game markets are very heterogeneous. Multiple game platforms, technologies and game consoles exist and compete fiercely for market dominance. The standard battle shows three dimensions: game console, operating system and actual game programming technology.

Game Development Technologies:

- Symbian/S60

- Mophun

- ExEn

- Microsoft Mobile

- J2ME/MIDP

- BREW

- Flash Mobile

Operating Systems:

- Symbian/S60

- Linux Mobile

- Palm OS

- Microsoft Mobile

Mobile Game Consoles:

- S60 devices

- Nintendo GameBoy SP

- Palm Devices

- BNGO

- Nokia N-Gage

- Microsoft smartphones

- Sony PSP

One of the key battle areas is carried out at the mobile device operating level: Microsoft-lead Windows Mobile vs. Nokia-lead Symbian Series 60 systems. Nokia is currently in a strong position, but the true mass market for smartphones is only emerging. In the mobile game business, there is very strong competition originating also from the traditional game console manufacturers, such as Nintendo and Sony. These companies are adding communication features to their upcoming mobile game consoles (to be launched late 2004). This will surely intensify competition on the mobile game markets further. One additional dimension to the mobile battlefield is similar to the one seen in the early Internet years—the battle of the preferred mobile Internet browser. Norwegian Opera Software (supported by Nokia and Sony Ericsson) is taking a major challenge to compete against Microsoft's Mobile Internet Explorer (pre-installed on e.g. Orange Smartphones' SPVs). This competition will also have its impact on at least the mobile game sites browsing technology solutions. The current trend seems to be that WAP-based sites are becoming more and more XHTML-based sites. Multiple standards create major challenges for mobile game developers. A game created with one technology solution has to be re-created for another platform. Different screen sizes, varying sound solutions, operating system differences and memory shortages limit the possibilities for rapid game software transfer from one platform to another. Additional challenges can also be created by game crackers—the mobile device is no exception in its challenge of intellectual property right protection. These challenges influence directly the profitability of multi-platform game development. Several development companies have selected only a few technology solutions and game platforms they support.

One of the most interesting technology development areas in mobile gaming relate to multiplayer games. Mobile game devices can be connected to a gaming server. The server enables gamers to play against each other regardless of their geographical location. Nokia has created a full-scale mobile online game

environment, the N-Gage Arena. This online service is an environment where N-Gage owners can compete, communicate and obtain special benefits for their activities. In traditional game console markets similar online services have become very popular (e.g. X-Box Live). Mobile online game services are expected to follow this trend.

An interesting dimension to mobile multiplayer gaming is brought by exploiting the location-identification features of the mobile networks. A Swedish company called 'It's Alive' has created a multiplayer game called Botfighters. In it players chase each other to various cellular network locations. The experiences from Botfighters indicate that there are interesting opportunities for combining real-life action and a virtual game play. German Jamba has created another interesting new mobile game concept. In their game "Attack of the Killer Virus" player shoots viruses/monsters projected to a real-life environment shown through a lens of a camera phone. A player has to move around with the camera to destroy the viruses. Similar kinds of combinations of cellular network technology and real-life experience will with little doubt increase in the future.

An innovative dimension to multiplayer gaming is created by a combination of television broadcasting and mobile phones. The players compete against each other by SMS commands in various kind of games, e.g. in shooting, skills, sports etc.. The users are charged by move, i.e. by SMS. These games have become surprisingly popular throughout Northern Europe-most probably due to the famous Warhol's 15 minutes (in mobile 15 seconds) of fame phenomena. People love to see their messages and game actions to be displayed to the large audiences which game-shows on television may gather. In the near future, similar kind of gaming communities may also appear around digital television applications in terrestrial, satellite and cable television networks.

Mobile Games E-Content Report 3: An integrating report by ACTeN (Anticipating Content Technology Need)

6.5 A Little Technical Digression

We now present a few Q&As about some of the technologies mentioned above.

The Symbian OS

Symbian OS is an operating system designed specifically for mobile devices. It is being developed by Symbian Ltd, a software licensing company that supplies the operating system for many data-enabled mobile phones.

How does Symbian OS work?

As an operating system software, Symbian OS provides the underlying routines and services for application software. For example, an email software that interacts with a user through a mobile phone screen and downloads email messages to the phone's inbox over a mobile network or WiFi access, is using the communication protocols and file management routines provided by the Symbian OS.

Symbian OS technology has been designed with these key points in mind:

- m To provide power, memory and input & output resource management specifically required in mobile devices
- m To deliver an open platform that complies with global telecommunications and Internet standards
- m To provide tools for developing mobile software for business, media and other applications
- m To ensure the wide availability of applications and accessories for different user requirements
- m To facilitate wireless connectivity for a variety of networks

About Symbian OS

Nokia has made Symbian OS its strategic choice for smartphone operating systems. The Nokia Series 60 Platform, currently the most widely used software platform in the smartphone market worldwide, runs on Symbian OS—as does the advanced Nokia Series 80 Communicator devices. The Symbian OS-based Nokia Series 90 platform delivers touch screen technology and an advanced software development environment for media-rich applications.

What are the benefits of Symbian OS?

- m Wide selection of applications available for a range of mobile phones
- m Implements industry standard protocols, interfaces and management services for IT system integration
- m Application development using industry standard Java and C++ languages
- m Extensive connectivity options—including GSM, GPRS, CDMA, WCDMA, WiFi and Bluetooth

Mophun

Mophun is described by its creators (Synergenix) as a “software-based videogame console”. Its java based, but has ability of much higher performance (than J2ME). But Mophun has not spread this wide like java games. (Only some SE and a few Nokia mobiles can handle Mophun games) There are no freeware Mophun games—every programmer has to send the source code to Synergix and they compile and distribute it.

You can check www.mophun.com to see what Mophun games available, and you can buy Mophun games at www.mophungames.com.

ExEn

Developed by In-Fusio, ExEn (for Execution Engine), is the very first software dedicated to mobile gaming.

Small and light, (less than 100kb of ROM and 32kb of the RAM in its initial version) the software’s main function is to download and run games on mobile phones.

ExEn is very small footprint (only 5 per cent of standard phone memory) fits in the mass market handsets.

ExEn offers the very best video game interfaces for real time animated graphics and reaches a performance level 30 times superior to a generic virtual machine.

ExEn turns mobile phone into portable consoles. Once downloaded, games display a fireworks of new features.

Working as a virtual machine, ExEn is also a safe engine for handsets preventing many of security issues (viruses, crashes...) that occur when games are run locally. Part of ExEn's development is dedicated to security: the software provides built-in identification, useful for billing, statistics, data mining, customisation, etc..

Since July 2001, In-Fusio registers over 3,000,000 interactions per month without any problem related to functioning of the games engine.

BREW

BREW stands for Binary Runtime Environment for Wireless. BREW allows users to select, purchase and download, over-the-air, a variety of games, ringtones, entertainment options and productivity programs—anytime, anywhere—directly to their BREW-enabled device.

BREW is not an OS; it is an environment in which applications run—hence Binary Runtime Environment for Wireless. The BREW platform does not preclude an operating system from being run on a device. In fact, the BREW platform can co-exist and complement an operating system running on the same device. BREW technology allows the OS to access embedding chip functionality, such as MP3 and MPEG4 capabilities; however, it is interposed between applications and core system functions—thus protecting the handset operating system.

One does not pay extra for BREW to be installed on the device. One does have to pay for applications one downloads and uses via the BREW service.

Palm OS

Since the introduction of the first Palm Pilot in 1996, the Palm OS platform has defined the trends and expectations for mobile computing—from the way people use handhelds as personal

organizers to the use of mobile information devices as essential business tools, and even the ability to access the Internet or a central corporate database via a wireless connection.

Palm OS 5, which has been available to customers for years, supports ARM-compliant processors. Palm OS Garnet is an enhanced version of Palm OS 5 and provides features such as dynamic input area, improved network communication, and support for a broad range of screen resolutions including QVGA.

Palm OS Cobalt 6.1 is the next generation of Palm OS. It will enable the creation of new categories of devices for the communications, enterprise, education and entertainment markets. Palm OS Cobalt 6.1 provides integrated telephony features, support for WiFi and Bluetooth, and enhancements to the user interface.

As with previous versions of Palm OS, Palm OS Garnet and Palm OS Cobalt retain application compatibility with existing 68K-based applications.

6.6 Mobile Gaming: A Fad?

A whitepaper from ericsson.com.au states that youth, entertainment and mobile phones make a powerful brew; that the evidence from stellar mobile Internet player iMode in Japan supports this. iMode boasts 23 million subscribers, 46 per cent of whom are 15 to 24 years old. Of interest is that 52 per cent of iMode revenue comes from mobile entertainment.

Many analysts see a bright future for mobile games flowing from advances in networks (GPRS, EDGE, 3G), application environments (WAP / CHTML) and developments in devices and operating systems. But equally important are challenges in the traditional electronic games industry, which provide a fertile environment in which a mobile games industry will flourish.

The games industry includes giant platform suppliers such as Microsoft, Nintendo and Sony; games publishers, developers and platform suppliers.

There are clearly defined main game forms within the industry such as:

- m Action adventure—e.g. Tomb Raider
- m Driving / flying simulator—e.g. South Park Rally
- m Role playing—e.g. Legend of Zelda
- m Edutainment—e.g. Where in the world is Carmen San Diego; and
- m First person shooter e.g. Doom, Quake, Duke Nukem, Metal gear solid.

Game publishers face a very challenging commercial environment. Hostage to a few proprietary game platforms, they pay license fees to develop a game to a given technology. Within perhaps six weeks of their game reaching the shops the game is cracked and pirated. Industry insiders claim that rates of piracy of games in the U.S. are 18-20 per cent, in Europe 25-30 per cent, and in Asia 85-90 per cent.

Cash flow for game publishers is particularly problematic. Their game investment costs (development and licensing) are up

front but getting money from their channels takes upward of 65 days. This difficult commercial position prompts game publishers and developers to consider carefully the emerging mobile games market opportunity.

For publishers, the Mobile Internet provides the prospect of building online communities around game titles and to thereby better defend intellectual property rights. By revenue sharing with network operators on mobile games cash flow can be radically improved.

Another advantage is market reach. Nintendo is reported to have taken 10 years to sell 100m Game Boys 2 whereas the mobile phone industry will sell around 400 million mobile phones worldwide in 2001 alone.

Indeed, there is a 950 million mobile subscriber base worldwide. In many markets carriers subsidise the acquisition of the phone to win the customer's traffic. Furthermore, with consumers upgrading their mobile phone on average every 18 months, more and more consumers will acquire phones with packet data, WAP, Bluetooth and other capabilities, around which more sophisticated mobile games will develop.

Today the games you can play on a mobile phone are nowhere near as powerful as those on an X Box, Playstation 2, or Gamecube, but popular nevertheless. The mobile platforms are nevertheless becoming more powerful. Phones are becoming merged PDA's and communicators. The Ericsson R 380 is just one example.

A colour screen is another temporary disadvantage of the mobile games platform. In Japan (where mobile games are hugely popular), some 90 per cent of new phones already have colour screens. In Australia colour screens are now available and will be increasingly de rigueur.

Elements of the mobile world match naturally with certain game types, which will lead to new dimensions in game play. Bluetooth for example (a short range radio connectivity / cable replacement technology) which is now built into launched Ericsson phones like the T68, R520 and T39 allows multi-player games without multi-tap add ons, conceivably on different manufacturers' mobile devices. The R520 for instance, allows you to play tennis across the Bluetooth communication link.

Game types like action adventure, role playing, sports games, edutainment, and first person shooter morph through combination with new mobile Internet elements. Swedish company 'Its Alive' enhances the traditional first person shooter game form by adding mobile positioning, SMS, WAP and mobile phones. The game then becomes virtual paintball.

During a game play, the player sends an SMS (or uses his WAP phone) to check his targets real time physical location. If the target is within range, the player can shoot by sending a fire SMS. The damage caused depends on the type of weapon used, the efficiency of the target's shield and other preferences held by the players.

Another Swedish company BlueFactory follows a similar game theme with its newly announced mobile game Hunters & Collectors. This game lets players choose and develop an identity and to challenge other players in close proximity using SMS and global positioning technologies.

But it's not only the specialist entertainment developers who are getting into mobile games. The Disney Internet Group International (DIG) is making serious inroads in Japan as a content provider for iMode. Disney is reported to be engaging in extensive talks with operators worldwide to offer content and applications packages.

UK-based Digital Bridges is busy with mobile games and will produce Star Trek games for the wireless Internet. CEO and

founder of Digital Bridges, identifies an essential characteristic of wireless gaming:

“Your cell phone offers possibilities which no other technology can match. Imagine sitting in a boardroom or classroom, when your phone bleeps and delivers a message telling you, your ship is under attack. You know that you’re going to stand up and say ‘Excuse me. I have to take this...’

Digital bridges has built its Start Trek games in a persistent universe which means that the game is always on as indeed is your wireless Internet connection with packet data elements like GPRS. Beam down workplace productivity Scotty!

The action adventure format gets a wireless work out by Jamdat, a Californian mobile entertainment technology company.

The success of Gladiator reminds us that games can succeed on relatively simple platforms partly because people have time (particularly when commuting) that is ideal for on-line entertainment. Use of commute time partly explains the success of games in Japan.

For the mobile game industry to flourish, the developer community will need to be nurtured. Carriers will seek open platforms that encourage competition and games creativity, whilst recognising unique mobile network characteristics. The recently announced cooperation between Ericsson, Motorola and Siemens recognises the challenge.

Ericsson, Motorola, Inc. and Siemens Information and Communication Mobile, recently announced plans to develop an industry initiative to define a universal mobile games platform, using existing and emerging standards.

“Our aim is to promote an open approach to the mobile games market by supporting current—and future—standards and by col-

laborating with all interested industry players. Jan Lindgren, vice president of Ericsson Internet Applications.

The mobile games market represents an exciting new dimension of the entertainment sector. The market is being driven by rapid developments in platforms, industry standards, devices, networks, application environments and the commercial pressures of the traditional electronic games industry.

The mobile industry is hoping mobiles will drive more women to gaming because they are easy to use.

“Mobile games providers have access to a huge potential user base of both sexes, but so far there’s still only a small proportion of women gamers,” according to Julian Bright of Total Telecom magazine in an interview with the BBC.

A study in the US recently, conducted for Cingular Wireless by International Communications research, and reported by Cellular News last June, claimed there was little difference between men and women using gaming features and that surprisingly, approximately 6 per cent of women, compared to 3 per cent of men, use the gaming feature frequently on their wireless phones.

Another survey by the US games industry analysts, the Entertainment Software Association, showed adult women now make up a larger percentage of the gaming population than boys aged six to 17.

At a recent mobile games conference, Mark Stanger from developers Eidos suggested 82 per cent of UK mobile gamers were male, while 92 per cent of PlayStation 2 players are men, according to the BBC.

Mobile Gaming More Than Just A Fad

Mobile gaming is far more than just a fad, according to a new report published by The NPD Group. The report, which provides an

in-depth look at consumer demand for mobile games, is based on a recent survey of more than 8,500 teens and adults conducted by The NPD Group and explores the key growth drivers in this flourishing market, including purchasing habits, who's buying vs. who's freeloading and just how much they'll pay to play.

"The world of mobile gaming is like the Wild West," says Clint Wheelock, vice president of wireless research for The NPD Group, who oversaw the study. "In this time of rapid growth, and with the industry in such a formative stage, it's especially important for wireless operators and game publishers to understand the mindsets of mobile gamers, in order to best position themselves for long-term success."

According to the report, the addressable market for mobile games continues to expand quickly, with half of all U.S. wireless subscribers now owning phones capable of downloading games. A full 27 percent play games on those devices, including purchased downloads as well as free demos and pre-loaded games, compared to 20 percent last year. Even better for the industry, the market hasn't come close to tapping its potential—another six percent of current non-gamers confessed an interest in playing on their phone over the next year. The reason most often cited for the burgeoning interest: "to kill time or alleviate boredom." In fact, the average gaming session is a mere 11 minutes.

The Players and What They're Playing

Mobile games are a "digital snack" for video gamers while they're away from their game consoles, PCs, and handhelds—consumers who play games on other devices are twice as likely to play on their cell phones, as well. But limited screen size and navigation options do have an impact, which is a key reason why casual games like puzzles and cards are the most popular. Not surprisingly, kids between the ages of 13 and 17 (60 percent) are nearly three times as likely as adults (23 percent) to be mobile gamers. More surprising, however, is the increasing ethnic diversity of the mobile gaming community—compared to typical wireless subscribers, mobile gamers are twice as likely to be African-American, Hispanic or Asian.

The Price Conundrum

According to the report, mobile gamers tend to spend more on handsets—an average of 57 percent more. They also tend to be heavier users of their mobile phones for regular calls, using 48 percent more wireless minutes than non-gamers, and their monthly wireless bills are 22 percent higher than the average subscriber.

But not all of the news is positive for the mobile gaming industry. According to the report, there's a significant price sensitivity issue, which is inhibiting the industry from really taking off. That helps explain why only about one-third of mobile gamers actually buy the games themselves. The remaining two-thirds are satisfied playing free or pre-loaded games. And just like digital music, the dominant purchase model is single downloads, while monthly subscriptions barely show up on consumer's radars.

6.7 The Top Ten Mobile Games

Mobile Magazine recently put together an interesting list of the top 50 mobile games. Instead of just concentrating on mainstream handheld titles, the list includes classics from Game and Watch Fame, less than successful platforms like the Zodiac and even stand-alone contraptions like Merlin. Only one Playstation Portable or DS title made the top ten (Wipeout Pure).

Here are the top ten from the list:

10. Coleco Pac-Man (1981)
9. Electronic Battleship (1983)
8. Solitaire (Pocket PC, 2000)
7. Mortal Kombat (Sega Game Gear, 1993)
6. Wipeout Pure (PSP, 2005)
5. Mattel Football (1977)
4. Bejeweled (Smartphone, 2001)
3. DopeWars (Palm, 1999)
2. Donkey Kong Country (Game Boy Advance, 2003)
1. Tetris (Game Boy, 1989)

Back To the Future



Technology has already come a long way, yet there's much more development scope ahead. What are the new things one can expect in the coming years (or months) that will once again redefine the audiovisual experience? Are they worth waiting for? Will they change our world? We bring you some selected insights into the future of Digital Entertainment



In the previous chapters, we have talked at length about how effectively digital leisure has become a part of our lifestyle without us taking cognizance of it. We have also seen in detail about the components and devices; be they hardware or software that makes going digital affordable and sensible for us.

In this chapter, we will talk about what the future holds for us in the digital entertainment arena. We will also see how two new formats of home video entertainment are battling it out for supremacy in the digital video arena and much more. With newer and newer devices being introduced in the market, it is just a matter of time before our leisure lifestyle acquires a whole new look.

7.1 Upcoming Technologies

First, we will take a look at the new emerging technologies that will impact our future in the digital entertainment arena.

As mentioned earlier, the digital audio segment has two competitors on the horizon; DVD-Audio and SACD. These two are the only formats that are being currently pushed in the market. Since we have already talked at length about both, we will shift our focus to the digital video segment where the action is a wee bit more exciting.

Digital video is the mainstay of home entertainment since people like watching movies. It is in our nature to visualise and this is where video steps in.

Starting with the VHS tape, we have come a long way to the DVD that is the new face of entertainment. However, this format will soon be history if some companies have their way.

A DVD provides more space for storage than any other removable media that is currently available to consumers. With the advent of DVD, you can not only see movies with more clarity, but also other 'featurettes' such as "Behind The Scenes" and "Director's Views" that are not available on a VCD. Such additions make buying a DVD more appealing to the consumer. This is clearly because of the 8.5 GB space that is available on a DVD. Now multiply this amount of data by five and you will get the idea on the future of digital storage.

Blu-Ray is a technology that is being pushed by Sony and other major companies including Apple, Dell, Hitachi, HP, JVC, LG, Mitsubishi, Panasonic, Pioneer, Philips, Samsung, Sharp, Sony, TDK and Thomson.

The Blu-ray format was developed to enable recording, rewriting and playback of high-definition video (HD), as well as



storing large amounts of data. A single-layer Blu-ray Disc can hold 25 GB of data and can be used to record over 2 hours of HDTV or more than 13 hours of standard-definition TV.

There are also versions of dual-layer discs that can hold up to 50 GB of data. This is five times the amount of space available on current DVDs. So is everything a bed of in the future? You could not be more wrong!

Blu-ray's chief and perhaps only competitor is HD-DVD whose major proponents are Microsoft and Toshiba. According to Toshiba, the current DVD and HD DVD share the same basic disc structure: back-to-back bonding of two 120mm diameter substrates, each 0.6mm thick. As a result, HD DVD combines advanced capabilities with essential backward compatibility. The HD DVD standard clearly promotes early and cost efficient disc and hardware production, assures quality, availability, and marketability.

Here is a small table that should give you a general idea of how these two formats fare against the normal DVD.

DVD Parameters

Parameters	DVD	HD DVD	BD
Capacity per layer (GB)	4.7	15	25
Max number of layers	2	2	2
Max number of sides	2	2	1
Disc thickness (mm)	0.6 + 0.6	0.6 + 0.6	1.1 + 0.1
Laser wavelength (nm)	650	405	405
Numerical aperture	0.60	0.65	0.85
Cartridge	No	No	No
Tilt control needed	No	Yes	NA
Hard coating needed	No	No	Yes
Complexity to read regular DVD	—	OK	More complex

There is also talk of having dual layer versions for the masses available a little later, that is, after the launch of both these products. But that is still subject to speculation since both products are yet to go mainstream and the first—either HD-DVD or Blu-ray—is slated to be launched later this year or only early next year.

But with the roses come the thorns. With all the hullabaloo of Blu-ray and HD-DVD making the rounds, there is a hidden cost of improvising your existing equipment too. So while your current DVD player will probably play HD-DVD discs, you will need to buy a new player for watching movies on Blu-ray discs. Backward compatibility does not seem to be a major factor since these players are assumed to be able to play older DVD discs without any issues.

Regarding watching movies on your PC, which is more on the lines of making your PC your entertainment hub, it could be an issue with both disc formats. Why? Let's get to know the new face of copy protection.

7.2 Copy Protection

Given the rampant piracy of movies and music today, these discs would be encrypted with copy protection technologies that will make it harder, if not impossible, for pirates to either duplicate or copy data from a copy-protected DVD. Some of the best-known companies in the business, such as Macrovision and Sony, are ready with commercial solutions which they remain tight-lipped about.

Sony, though, has gone ahead and released details about the copy protection scheme that is assumed to be on the Blu-ray DVDs once they become available in the market. Here are some of the details:

The Blu-ray content management system includes three primary components: Advanced Access Content System (AACS), "BD+", a Blu-ray-specific enhancement for content protection renewability, and 'ROM Mark', a measure unique to Blu-ray Disc to guard against mass production piracy or the mass duplication and sale of unauthorized copies of pre-recorded media.

In addition to AACS, there is another hitch called the ROM Mark. The ROM Mark technology embeds a unique and undetectable identifier in pre-recorded BD-ROM media such as movies, music and games. While invisible to consumers, this ROM Mark can only be mastered with equipment available to licensed BD-ROM manufacturers, essentially preventing unauthorised copies of a disc.

Finally there is BD+ which enables Blu-ray Disc specific programmable renewability enhancement that gives content providers an additional means to respond to organised attacks on the security system by allowing dynamic updates of compromised code. But there is a downside to these copy protections too.

For us inserting a disc in the player and then watching a movie, or listening to music for that matter or playing a game is

pretty simple. But in the gap of few seconds that occur during the time for the disc to playback, a lot of activity such as key exchange, symmetric/asymmetric encryption happens in the background.

Trying to use BD or HD DVD on a PC or on a standalone player may not be that problematic since legal software will let us do that. However, technology such as BD+ can cause a lot of heartburn for consumers.

This is because device keys and media keys are still there, with a major change. In the first steps of content decryption, a player has to find its specific key in a big ternary tree of keys, where each leaf corresponds to the key of a given device (brand and model).

By denying a drive to find its key in the tree, Blu-ray and HD-DVD can easily revoke a single given device. If, for instance, a given player is cracked and its keys are published, the licensing authority will send new keys and navigation information to disc manufacturers. As a result, all discs pressed after the player has been cracked will refuse to play on this specific drive, but will play perfectly on all other (including older) devices.

So one fine day, you could suddenly be unable to watch new movies on your player because it has been revoked after someone has successfully compromised this model. It may not matter for users who are involved in illegal practices, but it will matter to authentic users who will find themselves denied the right of watching something that they bought legally! So is this new form of copy protection good or bad? As usual, only time will tell.

7.3 Digital Entertainment in India

None of this talk about the future of digital entertainment would hold much water if we didn't want it in the first place. However, that is not the case and more and more of India is jumping onto the digital entertainment bandwagon. Have you noticed how many commercials advertise the CD and the DVD on TV today?

India has been a late entrant on the digital entertainment scene. However, today it commands the respect of the top-of-the-line companies on this planet. Most of these have a showroom in India and a thin albeit growing clientele.

DVD's, SACD's or for that matter, any other technology, will not matter unless it is accepted by the masses. International firms such as Sony, Philips, and Samsung among others know this and are catering to the masses with their catalogue of products, which have something to suit everyone's pocket. If you are the one who is building your first home theatre, then you could very well opt for a Home Theatre in a Box (HTiB) solution. For the connoisseur, well, choose and build.

Here, if you notice, we are concentrating on Home Theatres as the gateway for Digital Leisure. This is because whatever revolutionary technology we are talking about in this chapter will directly influence consumer electronics more than anything. If users want to experience a technology such as HD-DVD then a home theatre is the best and the cheapest way to do so.

Talking about the range that is available for the general consumer in India, Sony, with their model the DAV-DZ100 is the entry-level Home Theatre with 720W RMS of total power, Dolby Digital/Dolby Pro Logic II and DTS decoding. However, the Sony DAV-DZ200 hits the sweet spot. This baby has a total of 720W RMS peak power and can also play Super Audio CD's along with the regular DVD's and MP3 CD's and stuff and before we forget, it can also play DivX files.

There are similar models from Philips and Samsung that cater to all these mentioned segments. However, these models are meant for the current generation of media that is available. Some of these models may not even play DVD Audio discs unless it is explicitly mentioned in the manual or product literature. Newer models that support BD-DVD and HD-DVD playback are yet to be launched worldwide.

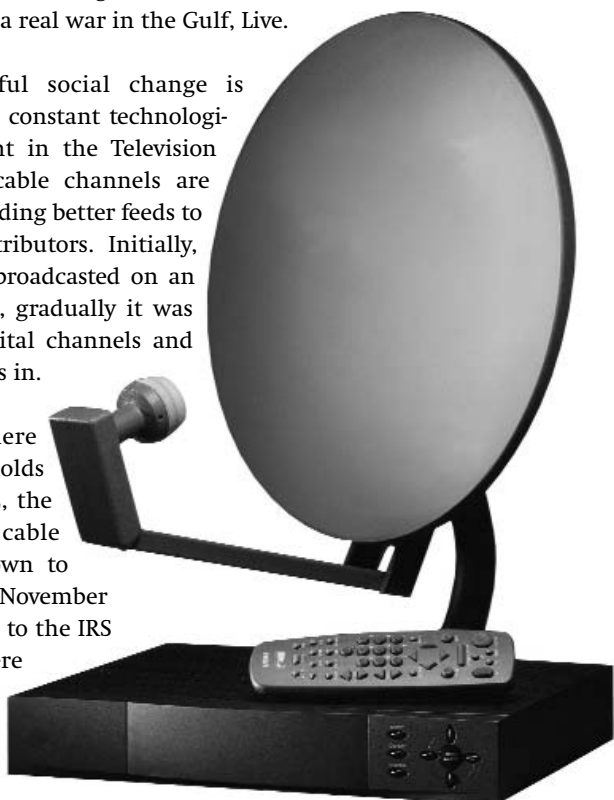
In the next section, we will talk about the satellite TV revolution that has taken India by storm since the early '90s. Even before the concept of the home theatre made its presence in India, satellite TV has slowly and quietly crept into our daily lives and made sure that entertainment never remained the same again. This information is required to understand the basic framework or groundwork that lets technologies of the future build on it.

7.4 The Satellite Revolution

The early 1990's marked a significant change in the Indian media industry. It was the first time since Independence that Indian media became a commercially competitive industry. This was partly due to economic liberalisation, but mostly due to introduction of cable and satellite television in India. It provided a window for billion Indians to see what is happening in the rest of the world. It opened India's social and business eyes in more ways than one. It resulted in the expansion of television not only as an entertainment medium but also as a powerful media tool which further led to many technological changes in ON-AIR broadcasting. It all began with a bang, as for the first time people watched a real war in the Gulf, Live.

This powerful social change is underlined by a constant technological advancement in the Television Industry. The cable channels are constantly providing better feeds to local cable distributors. Initially, channels were broadcasted on an analogue signal, gradually it was replaced by digital channels and now the HDTV is in.

From a mere 410,000 households in January 1992, the number of cable homes had grown to 1.2 million by November 1992. According to the IRS 2002 survey, there are about 38 million operators providing



satellite broadcast with a total TV audience of 79 million TV households currently.

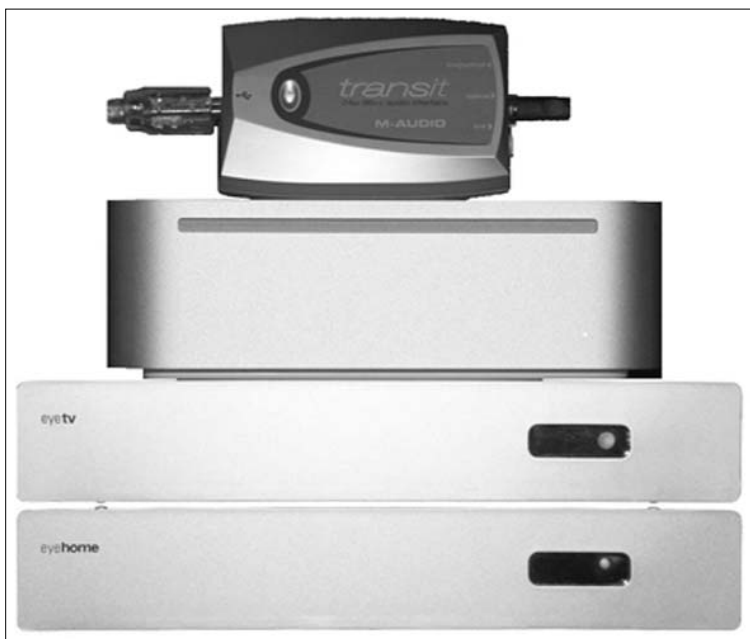
The Indian cable and satellite industry is one of the fastest growing industries in the world. Currently, there are about 250 channels being transmitted over Indian skies with more than 100 channels originating from Indian shores. The major Broadcasters include Doordarshan, Zee, Star, Sony, Sun TV, ESPN - Star Sports. Other prominent broadcasters are ETC, ETV, Turner and Discovery. Currently there are multiple pay-channels and some are even free to air channels.

However, most of the operators have one-way 450/550 MHz networks capable of delivery 45 - 55 channels. The upgradation of the network has only taken place in metros with operators setting up HFC networks and 750/860 MHz networks. The number of channels shown in most cities ranges between 80 and 90 to between 60 and 70 in smaller towns. It varies from 25 to 45 in the rural areas depending on the capacity of the networks.

With the growth in market, technology is bound to evolve. Today, people are shifting from cable TV to their own satellite dishes. The cost of having a personal satellite dish has come down tremendously as compared to the mid-90's.

A personal dish provides better audio and video quality. It features 5.1 audio range as compared to the mono sound quality of cable TV. With HDTV no longer merely conceptual, this technological umbrella will only have wider and better video and sound quality. The current HDTV format is to have 7.1 Stereo channel and a video quality of 1080i x 780i, which is twice as better than your standard DVD.

HDTV or High Definition Television simply provides broadcast of television signal at a significantly higher resolution than the current formats of NTSC, SECAM or PAL. HDTV provides transmission that was only available on stored media. In eventuality, it will be even better than standard DVD.



MPEG-2 is the most commonly used compression Codec for digital HDTV broadcasts. Although MPEG-2 supports up to 4:2:2 YUV chroma subsampling and 10-bit quantisation, HD broadcasts use 4:2:0 and 8-bit quantisation to save bandwidth. Some broadcasters also plan to use MPEG-4 which will enable it provide even better audio quality with higher resolution pictures and a theatre-like experience on your HDTV-compatible TV set. This also means that recording of TV programs would require a new technology as well.

HDTV can be recorded on D-VHS (Data-VHS), W-VHS, or on a HDTV-capable digital video recorder such as DirecTV's high-definition TiVo or DISH Network's DVR 921 or 942, or to a computer which has a HDTV capture card installed. HDTV cannot be recorded on a standard storage media; it would require at least a Blu-Ray DVD or HD-DVD.

However, not all HDTV's come with an inbuilt tuner (also known as ATSC tuner). Most of them come with a direct-plug in-

cable, but a few still require a Tuner. TV Sets that have these built in are known as integrated HDTVs, and those that don't, are called HDTV-ready or HDTV compatible; mostly they're all lumped together under "HDTV". If one has to buy an HDTV-ready set, a separate tuner (or cable or satellite box) would be required to watch high-definition programming.

One, therefore, needs to upgrade their TV sets to make them HDTV compatible. This is going to be the trend of the future, as the concept of scrambled programming enters the Indian television market. An HDTV set would be required to experience the real new age media revolution which can totally overwhelm your senses. So, if you buy an HDTV today, rest assured it won't become obsolete in next few years.

Plasma and Rear Projection TVs, which are also HDTV-ready, are available and in fact, consumers are already opting for these solutions since they offer better visual quality over the existing TVs. With the mass acceptance of the DVD and the home theatre consumers have a more than fertile mind for technologies of tomorrow to sow their seeds in.

Tips & Tricks



Due to space constraints, the Tips & Tricks section this time isn't as comprehensive as we would have liked it to be. But we do talk a little about ripping and burning CDs, and about how you can put Windows Media Player 10 to good use. There's also a small section that covers a few general tips on MP3s.

8.1 Ripping Tracks

Before you can play any music on your fancy player, you've got to have some digital music to transfer. It's time to rip - geek-speak for copying a track (say, from a CD) to your hard drive. Some players let you rip without a PC, but you'll often get better quality if you rip tracks to your PC first and transfer them to the player later.

Digital audio file formats such as MP3 (MPEG 1, Layer 3) and WMA (Windows Media Audio) compress bulky WAV versions of audio tracks into much smaller files. You'll find quite a few alternatives when it comes to ripping: MP3, WMA, RealAudio, LiquidAudio, Ogg Vorbis, and more. So how do you pick?

Let your player be your guide. Which formats does it play? All players can read MP3 files, and most can now play WMA files, so one of those two is probably your best bet. WMA files sound better at lower bit rates (a yardstick of quality and file size), but the MP3 format is far more popular and isn't subject to digital rights management that can prevent you from copying multiple versions of a file.

When ripping a file you'll select a format, then you'll need to consider the bit rate you want. In general, the higher the bit rate, the better the sound and the larger the file. Unless you're a gold-eared audiophile, an MP3 file encoded at 128 or 160 kilobits per second should be fine for a portable player; a WMA file at 96 or 128 kbps would be the equivalent and take up less memory - a major consideration on flash memory players.

8.2 Burning Data Onto CD

If you don't back up your data, you should. It's easy and can save you a lot of pain later if your PC eats a file or if you accidentally drop your hard drive out of the window. Because CD-Rs and CD-RWs hold only a maximum 700 MB of data, I'd recommend putting your documents on one CD, and other kinds of things, say your e-mail archives, on another. You shouldn't need to back up your various applications, because you should have the original

CD-ROMs for those already. These directions apply for CD-R disks and may differ slightly for CD-RW disks.

Before you begin, quit all other applications. The burning process is processor-intensive, particularly when you write at fast speeds. For the best results, reboot your PC before your CD-burning session, and make sure all but your essential apps are closed. Leave your AntiVirus protection loaded, but exit RealPlayer, for example. You should get more reliable (and faster) burns.

In the following steps, we instruct you to create an image file, which requires more steps but will help you avoid creating coasters (useless CDs). However, creating an image file isn't always necessary: If you have a really fast PC, with a 1 GHz processor and 256MB of memory, for example, you could skip the image-creation step and burn directly to the disk.

If you have a slower computer with less than 128 MB of memory, you may also want to burn at a slower speed, such as 4X - especially if you're copying directly from a disk in a CD-ROM drive. It will take longer, but the slower speed makes it less likely that you'll ruin a disk.

8.3 Tips for Your Listening Pleasure

A little effort goes a long way in the digital music world. Here are a few things you can do to improve your experience.

Clean your ID3s. Each digital audio file includes labelling information called an ID3 tag. The tag includes the name of the track, artist, and album. The tag can get even more granular and indicate year and genre. Most players display some of this information, and others use it to sort the files by artist, album, and genre. But the player can't sort correctly if the tags are wrong or incomplete. You can edit the tags through jukebox software or with special utilities.

Make a playlist. The software you use to rip your MP3s can also help you manage them on your portable player. A playlist is a

small file that tells the player what order to play the tracks in. You can have multiple playlists that group tracks however you like. Just be sure that when you download the playlist to your player, you download the tracks on the playlist, too.

Speed up your transfers. Getting files to your player can be excruciatingly slow, especially when you do it often. But you can eke out a few more kilobits per second if you have the latest available software and firmware for the player. Check your manufacturer's site regularly for updated versions.

Check your settings. Most players let you adjust the sound and display to some degree. If you don't tweak your player's settings, you can only blame yourself for the trebly sound, for instance. Adjustments usually include an equalizer and balance, and many players let you adjust the backlight on the LCD, scroll speed for the display, and more.

Need some fresh music? Check out these sites when you need some new downloads.

- m Emusic offers unlimited downloads for \$10 a month, and those files are yours to reuse as you please, even if you end your subscription. You can burn the tracks to CD and transfer them to a portable player. The downside: The selection is a bit weak, with few major names or albums. Jazz and blues fans stand to gain the most.
- m Pressplay, available through Yahoo's Launch and MP3.com, has most of the major artists—from Eminem to Bruce Springsteen. It offers various subscription levels beginning at \$10 for unlimited downloads. For \$18, you can burn or transfer 10 tracks a month, and those tracks are yours to keep. Other downloads expire when you end your membership.
- m Amazon lets you try before you buy. It has a great Free Downloads section in its Music area. Many hot and up-and-coming acts can be found here. Check if the file is in MP3 format if you intend to transfer it to your player.

- Don't forget about your favourite artists—they may give out samples on their own sites. This depends on the artist, of course, but many acts find MP3s to be great promotional tools. They want you to take it, so go get it!
- RealOne by Real is an all-in-one media player. It includes powerful ripping software along with great file management. Many players have plug-ins that allow you to use RealOne to transfer tracks to your player; it can burn tracks to CD, too. The paid version (\$10 a month) adds faster encoding and burning, plus a subscription download service.
- MusicMatch Jukebox is an MP3 jukebox application. It can rip, burn CDs, manage files, and more. The paid version improves ripping and burning speed for a one-time fee of \$20.
- Nullsoft's Winamp is a simple free player. It supports many formats and is great for making playlists. It won't let you burn CDs, though.
- MoodLogic edits the ID3 tags of your digital audio files, adding details like year and mood for \$30. It really helps you sort your collection.
- Dr.Tag helps you edit your file's ID3 tags with a minimum of fuss. The "automatic" button uses the file name to guess the artist, track, and album information.

8.4 Windows Media Player 10

- **Rip CDs Automatically:** Automatically rip CDs with Windows Media Player 10 just by placing them in the drive.

Windows Media Player 10 can be configured to automatically rip CDs (copy the contents to your hard drive using a compression format) whenever they are inserted into your computer's CD-ROM drive. Plus, to make things even easier, Media Player can also eject CDs as soon as the ripping is complete, allowing you to more quickly convert your music collection to digital.

1. Right click on the Windows Media Player title bar, choosing 'Tools', then 'Options'. If you are in Skin mode, just select 'Options'.
2. When the 'Options' multi-tabbed dialog box appears, select the 'Rip Music' tab.
3. Check 'Rip CD when inserted'.
4. Check 'Eject CD when ripping is complete'.
5. Click 'OK' to close the dialog box.

m Do Not Copy-Protect Music: Prevent Windows Media Player 10 from copy-protecting ripped CDs.

When ripping CDs to multimedia files with Windows Media Player 10, if you have not changed the defaults, Media Player may automatically copy-protect your music files. While helping to prevent illegal distribution of music, this can make it difficult to play your songs on another computer or media device. To see if this item is enabled and uncheck it:

1. Right click on the Windows Media Player title bar, choosing 'Tools' then 'Options'. If you are in Skin mode, just select 'Options'.
2. When the 'Options' multi-tabbed dialog box appears, select the 'Rip Music' tab.
3. Uncheck 'Copy protect music' if it is checked. If it is greyed out, your current audio format does not support copy protection, and you can safely ignore this checkbox.
4. Click 'OK' to close the dialog box.

m Change Multimedia Format and Quality: Change the audio quality and file type of ripped CD audio tracks in Windows Media Player 10.

With Media Player 10, you can choose the type of media files created after ripping CDs, as well as the audio quality of the files (the higher the quality, the more room each media file will take up on your hard disk). Plus, with version 10, you can rip files to MP3 format in high quality!

1. Right-click on the Windows Media Player title bar, choosing 'Tools' then 'Options'. If you are in Skin mode, just select 'Options'.

2. When the 'Options' multi-tabbed dialog box appears, select the 'Rip Music' tab.
3. Under 'Format', click the pull-down to choose your media type, such as 'Windows Media Audio' or 'MP3'.
4. Unless you chose 'Windows Media Audio Lossless', click on the slider bar underneath 'Audio quality' to choose between media files of a small size and those with high-quality audio. As you move the slider, the amount of room a ripped CD will take on your hard drive will be displayed.
5. Click 'OK' to close the dialog box.

Note that when you change these settings, only newly ripped CDs will reflect the new media type and quality. Files from previously ripped CDs will retain their multimedia file type and quality.

m Change the Filenames: Change the details contained in ripped CD filenames with Windows Media Player 10.

Normally, when you rip CDs with Windows Media Player 10, the filenames are in the following format:

track_number-song_name.media_type

For example, if you are ripping to Windows Media Audio:

10 Symphony.wma

Or for example, if you are ripping to MP3:

11 Fanfare.mp3

If you'd like to change the file format to display different information, such as the artist name, do the following:

1. Right click on the Windows Media Player title bar, choosing 'Tools' then 'Options'. If you are in Skin mode, just select 'Options'.

2. When the 'Options' multi-tabbed dialog box appears, select the 'Rip Music' tab.
3. Click the 'File Name' button.
4. The 'File Name Options' dialog box will appear.
5. Place checks next to the information you want placed in the filenames, such as track number, song title, artist, album, genre, and bit rate.
6. If you want one type of detail placed before another, click on the detail you want moved and click the 'Move Up' button. Likewise, to move a detail down, click 'Move Down'. As you make changes, look underneath the text 'Preview' to see a sample ripped song filename.
7. Click the 'Separator' pull-down to choose how you want the details separated in the filename, either with a space, dash, dot, underline, or no separation. Again, as you make changes, look underneath the text 'Preview' to see a sample ripped song filename.
8. Click 'OK' when you are done with your changes.
9. Click 'OK' to close the 'Options' dialog box.

m Not Getting Music Information Automatically: When ripping CDs with Windows Media Player 10, if album information is not downloaded from the Internet, perform this tweak.

When inserting CDs to rip into multimedia files, is Windows Media Player 10 not automatically downloading album information, such as song titles and composers, as well as cover art? If this is the case, you may need to change your privacy settings, if only temporarily as you insert new CDs to rip.

1. Right-click the title bar, choosing 'Tools' - 'Options'.
2. When the 'Options' multi-tabbed dialog box appears, click the 'Privacy' tab.
3. Check 'Display media information from the Internet'.
4. Click 'OK'.
5. Re-insert the CD to rip.

If this still doesn't work, try inserting a different CD. If your CD is slightly damaged, Windows Media Player 10 may not be able to cross-reference your CD with its database. Also, lesser-known CDs, such as rare compilations or music from local artists, may not be in the online database.

- **Disable Video Acceleration if Having Problems:** Disable video acceleration techniques if Windows Media Player 10 cannot play movies.

If you are having problems playing digital video with Windows Media Player 10, especially if you are running an older or custom-built computer, your machine may not be able to display video using all possible video acceleration techniques. Turning off video acceleration may allow your machine to display video correctly.

1. Press [Ctrl] + [1] to switch to Full Mode if you are in Skin Mode.
2. If the menu bar isn't visible, press [Ctrl] + [M] to turn it on.
3. Choose 'Tools' - 'Options'.
4. When the 'Options' multi-tabbed dialog box appears, select 'Performance'.
5. Underneath 'Video acceleration', move the slider from 'Full' down to 'None'. You may wish to try somewhere in the middle first.
6. Click 'OK' to close the dialog box.

After making the change, try playing video again. If it works, tweak the bar a little to the right till it fails and then tweak it one option to the left. Likewise, if the video fails, continue to tweak the bar to the left.

- **Enable DVD Parental Control:** Disable access to adult DVDs with Windows Media Player 10.

If you have children accessing your machine to play DVDs, you may wish to enable Parental Control features. This way, you can

limit the playback of DVDs rated with the MPAA (Motion Picture Association of America) depending on your choosing.

1. Press [Ctrl] + [1] to switch to Full Mode if you are in Skin Mode.
2. If the menu bar isn't visible, press CONTROL-M to turn it on.
3. Choose 'Tools' > 'Options'.
4. When the 'Options' multi-tabbed dialog box appears, select 'DVD'.
5. Check 'Parental control'.
6. The 'Select a rating' pull-down is now visible. Choose the highest-possible rating of DVDs that you wish viewable on your machine. For example, if you choose 'PG-13', DVDs rated 'R' or 'NC-17' will not be viewable on your machine.
7. Click 'OK' to close the dialog box.

As noted in the Windows Help, "you must set up appropriate Windows user accounts and passwords to use DVD parental control." This will help prevent children from bypassing the settings you make with this option.

m Video Size Shortcuts: Quickly change the size of movies played with Windows Media Player 10.

When playing video files, the following keyboard shortcuts may be useful in adjusting the size of the played digital video or movie:

Toggle full-screen video: [Alt] + [Enter]

Play video in a window at 50 per cent size - [Alt] + [1]

Play video in a window at 100 per cent size - [Alt] + [2]

Play video in a window at 200 per cent size - [ALT] + [3]

m Do Not Show Full-Screen Controls: Hide full-screen controls from covering up parts of your movies when played under Windows Media Player 10.

Normally, when you play videos in Windows Media Player 10 in full-screen mode, controls are shown on the screen allowing

you to pause, stop, skip around, etc. during movie playback. If you would rather these controls not appear, you can make the following changes:

1. Press [Ctrl] + [1] to switch to Full Mode if you are in Skin Mode.
2. If the menu bar isn't visible, press [Ctrl] + [M] to turn it on.
3. Choose 'Tools' > 'Options'.
4. When the 'Options' multi-tabbed dialog box appears, select 'Performance'.
5. Click the 'Advanced' button.
6. When the 'Video Acceleration Settings' dialog box appears, to the bottom and right of 'Video acceleration', uncheck 'Display full-screen controls'.
7. If you wish full-screen DVD playback to lack these controls as well, below 'DVD video', uncheck 'Display full-screen controls'.
8. Click 'OK' on the dialog boxes to close them.

m Show a Different Colour Around Videos: Show white or blue bars around movies when played under Windows Media Player 10.

Normally, when playing videos in Windows Media Player 10, if the video does not fill the full screen, a black border is placed around the video. If you would like to change the colour of this border, do the following:

1. Press [Ctrl] + [1] to switch to Full Mode if you are in Skin Mode.
2. If the menu bar isn't visible, press [Ctrl] + [M] to turn it on.
3. Choose 'Tools' > 'Options'.
4. When the 'Options' multi-tabbed dialog box appears, select 'Performance'.
5. Click the 'Advanced' button.
6. When the 'Video Acceleration Settings' dialog box appears, click the 'Change' button next to 'Video border color'.
7. Click 'OK' on the dialog boxes to close them.

- **Display Visualization Animations:** Display animations whenever you play multimedia files with Windows Media Player 10.

Windows Media Player 10 can display visualizations, or animations, whenever certain types of audio files are played such as WMA or MP3 files. To enable visualizations and choose the type of animation to display, do the following:

1. From Windows Media Player 10, press [Ctrl] + [1] to access the full controls.
2. If the menu bar isn't visible, press [Ctrl] + [M] to turn it on.
3. Select 'View' then 'Visualizations'.
4. From here, select the visualization you would like to see when playing media files. You can expand the menus to see more options.

Once you have chosen a visualization, open and play a media file. Press [Ctrl] + [2] to access the skin mode, or click the 'Now Playing' tab, and enjoy!

- **Download New Visualisations:** Download new animations that appear when playing multimedia files with Windows Media Player 10.

If you don't like the visualisations that come with Windows Media Player 10, you can download several more free ones on the Internet.

1. From Windows Media Player 10, press [Ctrl] + [1] to go to 'Full Mode'.
2. Press [Ctrl] + [M] to show the menu bar.
3. Choose 'View' > 'Visualizations' > 'Download Visualizations'.
4. A Web browser will open with several choices and a list of other sites that offer visualisations.
5. Select your desired visualisation. This may involve downloading a file, or first visiting a webpage then downloading a file. After downloading a file, you may need to follow on-screen prompts if a setup program appears.

Once you have downloaded and installed a visualisation, simply select it from Windows Media Player 10 in the 'View' > 'Visualizations' menu. Open and play a media file, switch to skin mode ([Ctrl] + [2]) or select the 'Now Playing' tab, and enjoy!

Another Web site you may wish to try for more visualisations is www.wmplugins.com.

8.5 How To Burn A CD With Windows XP

You have a CD burner in your computer, but have no idea how to burn a CD - well, here's how.

It's usually pretty easy. Most CD writers come with some kind of CD writing software. Since this varies from manufacturer to manufacturer, this is going to be a very basic lesson. It should help get you started though. Not sure where your CD burning program is? It should be lurking somewhere under the Start menu > Programs (it's not necessarily on your desktop or quick launch toolbar). Assuming you've discovered the location of your CD burning program, here's how it typically works:

1. First, if you get an option for either writing manually or via a wizard, pick the wizard (you can get fancier later on).
2. Now you are probably going to be asked what kind of CD you want to write, either audio or data. If you're saving files, choose data. If you're making a music CD for your own use from your own CDs, choose music.

Note that for music CDs and for stuff you want to archive, a CD-R is your best choice. If you have a CD-RW, use that for data that you may or may not want to save (they don't always work so hot for music, at least from the standpoint that many CD players refuse to play CD-RWs).

3. The next step is probably choosing files. Most of the time you'll get a 'Windows Explorer' type interface that lets you either choose files manually or just drag & drop.
4. That should be about it. At this point, you should have an option for writing the CD.

Note that most programs will let you 'test' before you write the CD. The first couple times you use the CD burner, this may not be a bad idea. If you find you have no problems, this is probably a step you can safely skip from then on.

During the actual CD writing process, it's best not to mess with your computer. Just stand four to six feet away and let it write the CD.

Why?

Most CD recorders record on the fly. If the computer is busy and can't get the info to the CD burner fast enough, you'll get a buffer underrun error - and your CD will be useless.

Burning with Windows XP

Did you know that Windows XP has built-in CD burning software? Here's all you do:

1. First, you need to tell Windows what files you want copied to CD. You can do this in a couple of different ways:

Method 1:

The first method is to right-click the file you want to copy, then select Send To, CD-R (or whatever your CD writer is called).

Of course, you can use your [Ctrl] key to select multiple files then send the whole mess to the CD burner.

When you do this Send To thing, you'll get a little 'balloon' from your system tray telling you that the files have been added to your recording list. Click that balloon and you'll open the list.

Method 2:

The next method is to open My Computer, then your CD-R or CD-RW drive. It's probably best not to have any CD in the drive at this point, since all the files on that CD will show up and make things a little confusing. Just drag and drop (or copy / paste) the files you need to copy to the open window. Note that when you send, drag, or copy these files, it only puts them on a list, it doesn't automatically start making the CD.

At this point you should have some files that have been sent to the CD burner. Now it's time to actually make your CD.

Stick a blank (writable) CD into your drive, open My Computer (if it isn't already), then double-click the CD-R/RW drive. You should see the list of files you've selected to record. Note that you may already be on this screen if you either did a Send To and clicked the balloon or if you did the drag and drop thing (since this was where you were dragging and dropping to).

Now, look for the CD Writing Tasks section. It should be at the top left of the screen.

Click the 'Write these files to CD' link and it will start Windows CD burning wizard. From there, just follow the prompts.

Note that if you accidentally stick a file on the list that you don't want on CD, you can remove it by right-clicking the file and selecting Delete. Don't worry, it won't delete the file from your computer, just from the CD writing list.

And as stated, during the actual CD writing process, it's best not to mess with your computer.

Why? Most CD recorders record on the fly. If the computer is busy and can't get the info to the CD burner fast enough, you'll get a buffer underrun error and your CD will be useless.

In fact, a good idea would be to turn off your AntiVirus program, screen saver, wallpaper, etc. (anything that might run in the background and disrupt the burning process). If you still encounter problems, you can lower the write speed.

8.6 Know When To Upgrade

Using the built-in CD-writing features in Windows XP is convenient, but this no-frills solution isn't enough for some demanding jobs. If you can answer yes to any of the following questions, you should begin looking into a more capable third-party CD-burning program:

- Do you want to create exact duplicates of data or music CDs? Windows Media Player forces you to copy the CD's contents to your hard disk first.
- Do you need to create ISO image files? As the name suggest, these files are perfect copies of a CD, which you can store on hard disk and use to make additional copies of a CD later. Windows XP can't create or copy ISO images, although the unauthorized ISO Recorder Power Toy can add this capability to Windows XP.
- Are you planning to make bootable CDs? Do you need to use disk formats other than standard data and audio formats, such as CD extra or Super Video CD? You'll need a program like Roxio's Easy CD Creator or Ahead Software's Nero to handle these chores.
- Do you want to use your CD-R or CD-RW drive as a backup device, with the option to compress files on the fly and span backups across multiple CDs? The newly released Nero 6.0 includes a serviceable backup utility, or you can invest in a dedicated backup utility.
- Do you want to record onto blank DVD disks using a recordable DVD drive? Windows XP can read and play back DVDs, but it can't record them.

Whitepapers



We have a small but interesting selection of white papers this month. The first, about future mobile entertainment scenarios, concludes, that the mobile entertainment industry “while still in its formative stages, shows signs of incredible potential.” The second white papers talks extensively about digital entertainment in the home and how devices should, and will, talk to each other.

9.1 Future Mobile Entertainment Scenarios

Here's an MEF White Paper on "Future Mobile Entertainment Scenarios": Research carried out by Booz, Allen and Hamilton; written and edited by Mobile Entertainment Analyst.

The term "mobile entertainment" refers to entertainment products that run on wirelessly networked, portable, personal devices. "Mobile entertainment" is a general term that encapsulates products like downloadable mobile phone games, images and ring tones, as well as MP3 players and radio receivers built into mobile handsets. The term excludes mobile communications like person-to-person SMS and voicemail, as well as mobile commerce applications like auctions or ticket purchasing.

An Introduction to Mobile Entertainment

Mobile phones with colour screens, data connections, FM radios, MP3 players, MPEG4 video players, digital cameras and entertainment content are now widely available across the northern hemisphere. More than 200 companies—from giants like Nokia, Vodafone and Microsoft to startups like Digital Bridges, Cash-U and PacketVideo—are vying for leadership in this emerging industry. To understand the ways in which mobile entertainment affects people's lives, let's follow one consumer, Jen Hanks, age 24, as she accesses and uses three mobile entertainment products. In the back of a cab, after the final encore of a two-hour Coldplay show, Jen is still singing the band's song "Clocks." She grabs her phone, scrolls through the ringtone application that she downloaded two months ago, finds the Coldplay section and downloads the tune. Behind the scenes, Jen's ringtone client application on her handset communicates with the ringtone server via the wireless network. The server debits Jen's pre-paid account and streams the song data back to her handset so she can set it as her default ringer. Jen is in good company as she grabs her new ringtone. In 2002, artists were paid more than \$71 million in ringtone royalties, which suggests that the estimated revenues for ringtone sales were between \$710 million and \$1 billion.

The next day, after a hectic morning of phone calls and emails, Jen escapes for lunch a little early. Arriving at the café before her friends do, she browses through the games section on her phone. She sees that her college favourite, Snood, has just been added to the content list. Selecting the “download” link, Jen triggers the game content server to download the Snood executable to her phone. At the end of the month, the fee (\$4.95) will appear on her standard monthly mobile statement. By downloading and playing Snood on her phone, Jen has joined the ranks of the 7 million people in the US who IDC estimates played a mobile videogame in 2002. The US market researcher estimates that by 2007, there will be more than 112.4 million US-based mobile gamers. Jen’s gaming break is interrupted by Tobias, who sits down at the café table simultaneously waving hello and nodding his head. His earpiece falls out and Jen hears the tinny but unmistakable sound of “Clocks” emanating from it. “When did you get that new phone?” she asks. “Yesterday” says Tobias. “Your song is, like, on every station.” Tobias’ new handset has a built-in FM receiver, so he listens to music on it rather than on his old portable radio. This feature is becoming more and more popular, with handsets from Siemens, Nokia, Sony Ericsson and many other manufacturers all supporting integrated radios. The three previously mentioned products, and many more like them, make up the broad category of mobile entertainment. It’s an industry that is expected to grow from 1.5 billion in 2001 to 15.4 billion in 2005. But how will it grow? And how will it be configured five to seven years from now? After a period of intense competition, innovation and consolidation, one of four scenarios will most likely emerge as the defining model for mobile entertainment. These four scenarios are: Mobile Operators Dominate, Mobile Device Manufacturers Dominate, Content Producers Dominate, or The Software Environment dominates.

This paper does not speculate on which scenario is most likely to emerge. Instead, after an examination of the current state of the mobile entertainment industry, the paper presents the opportunities and the risks for industry participants associated with each scenario.

The Current State of the Mobile Entertainment Industry

With entertainment-capable handsets now widely available in most of the northern hemisphere, and with content, distribution and billing systems widely deployed, the basic value chain for the mobile entertainment industry is in place. At its current stage of development, we have identified both technological and strategic issues that will drive the development of the mobile entertainment industry. This section will present the mobile entertainment value chain and each of the technology and strategy issues the industry faces.

Mobile Entertainment Value Chain

Starting with the companies that produce mobile entertainment's raw materials and moving toward the companies most closely connected to the consumer, the industry can be divided into eight distinct segments:

Content Origination:

This group of companies creates original content or provides recognizable brands, characters or themes for mobile entertainment applications. Companies in this segment include Disney, Vivendi Universal, and Sega.

Application Development:

By employing technical expertise or technology, application developers create individual entertainment products. Sample companies include Codetoy, Centerscore, Ideaworks 3D, and in-house development groups at larger companies.

Publishers/Aggregators:

These companies or divisions fund application or product development through advances against royalties, staged or one-time payments, or other revenue models. Portals or Web communities that gather and sell member-generated content also fit into this category. Example companies include Digital Bridges, JAMDAT, Aspiro and the wireless divisions of Sega and THQ.

Wireless Application Service Provisioning:

Companies at this stage of the value chain develop, implement or operate mobile entertainment platforms. Companies include Cash-U, OpenMobile, UCP Morgen and corporate divisions like Qualcomm's Internet Services division.

Portal Provisioning:

Portal Provisioners provide the network based customer interface and the content selections through which a consumer can access mobile entertainment products. Companies include wireless network operators, e.g. Vodafone (Vodafone Live!) and Telefonica (Telefonica terra mobile) as well as independent portals such as Yahoo! Mobile.

Mobile Delivery:

These companies provide the transport and settlement mechanisms for over-the-air mobile content delivery between content repositories and consumer handsets via gateway access infrastructure service providers and mobile networks. Example companies include wireless network operators like Vodafone, Telefonica, NTT DoCoMo, AT&T Wireless, Sprint PCS and gateway service providers like mBlox and Mobileway.

Mobile Device Manufacturer:

Companies involved in the design, manufacture and marketing of mobile devices and their operating systems. Companies include Nokia, Motorola, Siemens, Samsung and Microsoft.

Display, Marketing, Billing, Collection and Customer Care:

This group includes Mobile virtual network operators (MVNOs) such as Virgin Mobile, resellers and divisions of mobile delivery companies, and broadcasters (e.g. SkyTV) that distribute mobile content. This function is handled by corporate departments within many mobile delivery providers. Retailers of physical "packaged" mobile entertainment (retail packs) also take responsibility for these consumer-facing functions. Returning to the example cited in the previous section (Jen Hanks downloading the Snood game) the stages of

the value chain are clearly seen. The game characters, owned by Snood LLC (stage 1), were licensed by a publisher (stage 3) and made into a game by an application developer (stage 2). The game was stored on a content platform (stage 4) and then sent over a wireless network (stage 6) to Jen's handset (stage 7). Billing for content was handled by a company or corporate division (stage 8).

Technology and Strategy Issues in Mobile Entertainment

In an industry as young, complex and dynamic as mobile entertainment, there are dozens of factors that will influence the way that the industry develops. Many factors interrelate, and there are some that cannot be known at this time. There are eight factors, however—four technological and four strategic—that we believe will be the predominant drivers for the future of the mobile entertainment industry. By examining each of these eight drivers in turn, some of the most important determinants for the resulting industry scenarios can be laid bare.

Technology Drivers in Mobile Entertainment

Digital Rights Management (DRM): The issue of DRM affects all stages of the mobile entertainment value chain. Without the intellectual property protection that an acceptable DRM solution will provide, companies that can license content for mobile entertainment will be reluctant to do so. DRM solutions can also provide new and interesting revenue models for the emerging mobile entertainment industry (e.g. "super-distribution"). Four general types of DRM protection mechanisms have been developed with different levels of security. As the strength of content protection grows, the value of content available to the mobile entertainment industry will increase.

2. Platform Technology: As the number and variety of mobile devices grows, the desire of application developers for a unifying platform increases. Rather than developing one application for each device and operating system, a widely deployed platform would enable developers to create a single application to be used on a variety of devices. Current mobile entertainment platforms include Sun's J2ME, Qualcomm's BREW, Symbian's Series 60 and Microsoft's

Smartphone. In general, these platforms can be thought of as independent, but in some implementations they overlap. For example, Series 60 phones can run J2ME applications. For various reasons, no one platform has emerged as the undisputed industry leader. While there may never be a single winner, the drive to create and own established development platforms will have a major impact on the mobile entertainment industry.

3. Network Infrastructure: Any wireless network has to meet six criteria to be suitable for mobile entertainment applications. These six are coverage, bandwidth, availability, capacity, transmission quality and security. Characteristics and constraints on network infrastructure will dramatically change during the next five years-through new technology deployments, increased usage and other factors. The ways in which they change, and the companies that control those changes, will have significant influence on the mobile entertainment industry.

4. Mobile Devices: The capabilities available on mobile devices are expanding and changing with every new product release. Functionality never previously associated with phones (e.g. cameras, games, radios) is becoming commonplace. The fundamental criteria for entertainment-capable devices-color screens, battery capacity, processing power and device memory-will not constrain their entertainment capabilities. Instead, the speed with which new capabilities can be incorporated into devices, the inventiveness of new product bundling, and the consumer preference for “converged” devices will drive the future mobile entertainment landscape.

Strategy Drivers in Mobile Entertainment

1. Consumer Demand: Before the current wave of downloadable content was widely available, technologies marketed as mobile entertainment did not attract large numbers of consumers. In 2001, only 12% of German mobile phone subscribers accessed data content¹. However, more recent mobile entertainment applications may have spurred demand. In 2002, 46% of German mobile customers surveyed listed “fun” as their biggest reason for using mobile data services. While most consumers view mobile data services as too expen-

sive,³ initial indications from mobile game and music providers indicate that demand continues to grow for the current generation of mobile entertainment services. The way that consumer demand changes as market penetration increases will greatly affect the development of the mobile entertainment industry.

2. Consolidation: The economics of the mobile operator business is characterized by high fixed network costs combined with commoditization of traditional (voice) products and eroding margins. This makes consolidation between carriers likely in the coming years. Within other entertainment-oriented industries (e.g. radio, television, movies) consolidation among content originators and among distribution points has proceeded rapidly in the past five years. Independent videogame developers and publishers have also undergone a consolidation process recently, as development budgets have grown and competition becomes fiercer. The forces of consolidation have already, and will continue to, have an impact on the mobile entertainment industry.

3. Revenue Models: Viewed most broadly, the money that fuels mobile entertainment can come from two sources: consumers or advertisers. Money from both must be divided up among the stages of the value chain in proportion to the risk assumed in sufficient quantity to encourage growth. The failure of the previous generation of mobile data services was assigned partly to the lack of revenue flow from the consumer up the value chain. The success of the mobile entertainment industry depends on the development and propagation of sustainable revenue models that support value-adding companies at all stages of the value chain.

4. Substitutions and Outside Threats: As the availability of all entertainment grows, each media struggles for its share of the consumer's attention. While mobile entertainment has the advantage of portability/ubiquity, connectedness and relatively low incremental price, it is constrained by a number of factors. The ways and the channels in which consumers entertain themselves will determine the potential of the mobile entertainment industry.

All these drivers, plus, to a smaller degree, many others, are inter-related in a complex system. Each driver's individual development, its impact on the other drivers and the resulting affect on the industry value chain are unpredictable. However, based on historical analysis and the relative powers of members of the current industry, it is possible to describe four different scenarios for the future of this mobile entertainment.

Four Scenarios for the Mobile Entertainment Industry

During the next five years, the mobile entertainment industry is predicted to undergo significant growth. The Informa Media Group has predicted that the mobile games segment of the industry will grow from only tens of millions of dollars in revenue in 2001 to more than \$3.6 billion in 2006. Ovum Research expects mobile games revenue to reach \$4.4 billion by 2006. Similar predictions are being made for mobile music, photography and content. The way in which this industry is organized is of crucial importance to the companies within it, the companies that serve it and the broader business community. Based on an analysis by the Mobile Entertainment Forum and Booz Allen Hamilton, the four scenarios are that are most likely to describe the future of mobile entertainment are: Mobile Operators Dominate, Mobile Device Manufacturers Dominate, Content Producers Dominate, or Software Environment Dominates.

Each scenario below presents likely threats and opportunities in each scenario for the most affected members of the mobile entertainment value chain.

Mobile Operators Dominate

In this scenario, network operators control mobile entertainment. They leverage their existing customer relationships and extend their reach to include emerging networks like WLAN. As the gatekeepers to mobile entertainment consumers, operators extract a substantial percentage of all content revenues. Operators are likely to introduce flat-data traffic rates to spur usage. Mobile handsets are manufactured and branded according to operator specifications. Independent mobile portal providers are marginalized in favour of

operator portals. To differentiate, operators partner closely with content owners and thereby span the entire industry value chain.

Opportunities and Risks in Mobile Operator Scenario

Mobile device manufacturers are under the biggest threat in this scenario. Their opportunity lies mainly in their ability to become efficient producers of reliable commodity goods. Some device manufacturers will distinguish themselves through technical innovation, some through their ability to discount, but device primacy in the eyes of the consumer is lost here. The handset manufacturers that currently design their products in close consultation with their operator customers will have an opportunity to lead the market. Device manufacturers that are currently heavily invested in their own brands will be subject to the greatest threat.

By expanding along the value chain, mobile network operators can capture an increasing share of the overall industry value. In this scenario, mobile network operators have the greatest opportunity to build long-term, sustainable companies. The major risk for mobile operators in this scenario is that individual operators may overreach their ability to execute and thereby become targets for better-managed competitors. Operators that have already established themselves across regions or continents will have more relative power than smaller carriers if industry value shifts toward the operators. Operators also may, in the flush of their power, ignore consumer desires and the content-development expertise of entertainment companies. This arrogance will sow the seeds for consumer apathy toward mobile entertainment services and undermine the potential of the industry.

Portals with strong consumer support have the opportunity to extend their community into the mobile environment by gaining the endorsement of the mobile operators. It is more likely, however, that independent portals will be marginalized in the mobile environment by operators that want to control access to their customers. Service

Those service providers that can offer high value, difficult-to-replicate technology or support will have the chance to become inte-

gral and sustainable components of the value chain. Operators, flush with cash, will outsource difficult or non-core aspects of their businesses to these trusted partners. However, service providers that are too successful will prove tempting takeover targets, and marginal providers will be squeezed out of the industry through competition and increasingly high customer expectations. Publishers: As long as operators remember the importance of content in the entertainment industries, publishers of specialized content will be in a strong position in this scenario. Publishers with exclusive access to high-profile consumer brands will be able to extract premiums for mobile entertainment packages that differentiate one operator from another. Publishers skilled at finding “hot” or “underground” hits will find favour with operators seeking revenue and valuable niche audiences.

Publishers that cannot add value through financing, technology or distribution are likely to suffer because content owners will increasingly deal directly with the dominant operators. As long as sufficient intellectual property protection is in place, revenue shares and profitability are likely to be very high for premium content providers. Content leaders (whether brand owners or developers who invent appealing character-based brands) have the opportunity in this scenario to extend forward in the value chain and deal more directly with the operators.

Content providers that cannot offer brands that pull consumers risk being edged out of mobile entertainment as the operators increasingly seek “one-stop shopping” for their content. Developers risk being relegated to a “work for hire” status without the ability to innovate.

Supporting Evidence

Recent developments that support this scenario include:

WLAN build-out: Throughout Europe and the US, operators have been participating in WLAN network construction in addition to their mobile network plans. AT&T Wireless, Intel and IBM have announced plans to build 20,000 WLAN hotspots in the US. T-

Mobile has rolled out similar hotspots in Starbucks cafes in the US and Europe.

Operators Branding Devices: Global operators (most notably Vodafone and Orange) are pushing operator-branded devices. In general, those operators with a strong market positioning are choosing to work with device manufacturers less likely to insist on their own brand. NTT DoCoMo, the leading Japanese operator, is forcing device manufactures to adhere strictly to their own handset specifications. Operators all over the world are pressuring handset manufacturers for exclusive or unique features.

Flat Fees Emerging: Hutchinson 3G is offering 3G services in Italy at a flat rate and is considering a similar offer in the UK. In the US, both Verizon and Sprint PCS offer some form of flat-rate billing for data services.

Portals Reabsorbed: Vodafone recently re-integrated Vizzavi to form the core of its Vodafone Live! Content portal. O2 re-absorbed Genie and re-named it O2 Online.

Mobile Device Manufacturers Dominate

In this scenario, powerful, multifunctional devices have gained high penetration and consumer acceptance before full-featured networks can meet consumer needs. Operators have been unsuccessful at marketing content to consumers. Both traditional handset manufactures and game-oriented device manufacturers are dominant players. Perhaps various players in the device segment have merged. Mobile entertainment is primarily enjoyed offline. Network connectivity can easily be established via widespread large-bandwidth WLAN hotspots, home wireless networks or local area peer-to-peer connections. Operators are mostly excluded from content revenue. Device manufacturers will participate in content revenues through the distribution power of their proprietary portals (e.g. Club Nokia, My.Siemens), which could grow to encompass content billing and customer-care responsibilities. Device manufacturers also gain revenues by introducing hardware-based content tied to particular devices. In this sce-

nario, device manufacturers bypass the operators and control the value chain through their direct connection to consumers.

Opportunities and Risks in Device Manufacturers Scenario

The demand for feature-rich devices, and manufacturers' abilities to produce them efficiently, will bring handsets to the forefront of the mobile entertainment industry. Device manufacturers have the opportunity to extract the lion's share of the industry's value, and to grow by extending their control in both directions along the value chain. The main threat that mobile device manufacturers face in this scenario is that the entrance of related competitors (PDAs, handheld game consoles, PC makers) will drive prices and profits down.

Wireless operators are most adversely affected in this scenario. The demand for rich entertainment content, the ability for devices to display this content and the inability of networks to distribute it means that wireless operators get squeezed out of data revenues. With voice profitability continuing to fall, some operators will be driven out of business. The operators that are left standing are low-profit "dumb pipes" with little share in the profits of the mobile entertainment industry. Individual operators have an opportunity to leapfrog wireless technology limitations by investing in WLAN hotspots. However, for high-demand entertainment applications, all but the most aggressive hotspot rollouts will be insufficient. Increasing competition from consumer-savvy, niche-marketed, operator-independent WLAN providers will further hamper operator efforts. Portals: As with the operator-dominated scenario, portals that already have strong consumer followings may be able to extend their reach to the mobile environment through a manufacturer partnership. Independent or specialty portals may have more access to the consumer than under the operator-dominated scenario. However, the strength of manufacturer portals will limit independent portal growth overall. Successful mobile-only portals will be swallowed or ground down through limited access to consumers. As the device takes on increasing importance compared with the network, portals in general become marginalized.

Service providers will suffer as the demand for complex mobile platforms decrease and content shifts toward WLAN distribution. Their opportunity lies in picking successful independent portals to serve or, of course, becoming the backend to dominant mobile-device manufacturing services. Profitability will be limited by competition in a segment with fairly low barriers to entry. Very successful service providers will be absorbed by device manufacturers. Publishers, Content Providers and Developers: The rise of the device (instead of the network) will not hurt publishers, content providers or application developers as long as they can provide entertainment packages that consumers demand. The opportunities for this group lie in building content portfolios and leveraging the advanced device features for a compelling entertainment experience.

As this client-focused environment will be more familiar to content developers than would the network-centric model in the previous scenario, there will be less transition anxiety, less innovation, but more opportunity to leverage existing content. If device manufacturers become too strong, companies in these segments of the value chain may be forced to accept any deal terms to reach the mobile entertainment consumer.

Supporting Evidence

Recent developments that support this scenario include:

- m **Device Convergence:** Nokia's N-Gage (with content from top videogame publishers) as well as PDA/phone combinations point toward more functional mobile devices.
- m **Consumers Play Offline:** A recent study on mobile entertainment usage shows that 75 per cent of mobile gamers prefer to play at home, on the weekends, between 5 p.m. and 10 p.m.⁴
- m **Manufacturer Portals:** Nokia and Siemens offer comprehensive content on their portals. Other manufacturers (Samsung, Kyocera) emulate them.
- m **Manufacturer Retail Stores:** Nokia recently announced its entry into direct retailing to consumers.

Content Producers Dominate

Content or brand owners and publishers dominate the value chain

and are able to set prices as well as revenue model terms. In this content-brand-driven world, consumers identify most closely with the content and the brand itself, not the device it plays on or the transportation medium through which it arrives. Other members of the value chain, especially operators and device manufacturers, compete intensely again each other for differentiating content. By using access to top content as currency, content or brand owners and publishers will extend their control of the value chain by buying, or just controlling, content distribution points.

Opportunities and Risks in the Content Producer Scenario

If content producers dominate mobile entertainment, operators and manufacturers will earn only a minor share of content revenues while paying premium prices for exclusive access to brands. In some cases, operators and manufacturers will be forced to distribute less-desirable content in order to gain access to popular brands. This group's opportunity lies in its ability to license content proven in other media for translation to mobile. By providing content owners with mobile expertise, operators and manufacturers could capitalize on content owners' unfamiliarity with the medium. Because content owners will always be somewhat isolated from the technology and the data of mobile entertainment, operators and manufacturers could compete effectively with each other by providing business-critical information to content providers. Portals: Being closer to the content side of the value chain, specialty portals and niche-market mobile sites have better opportunities in this scenario than in the two previous ones. By aligning themselves with content producers, portals could ride the content wave and capture consumer loyalty. Nonetheless, there will be few independent portals, even in this scenario. Publishers and content owners will be the prime consolidators will control the main conduit to consumers. Service Providers: Service Providers with value-added offerings (especially in gateway infrastructure, billing, support or tracking) can succeed in this scenario. Their opportunity is in providing cross-network services, technical expertise, sales trends and market to content owners. The risk, however, is that Service providers become natural takeover targets for content owners seeking growth or control over technical expertise.

The consumer relation with brands and characters, as opposed to networks or devices, puts this group in control. Publishers and content providers will be able to leverage their holdings as crucial differentiators between operators and manufacturers, thereby earning the biggest share of industry revenues. In this scenario, publishers have the opportunity to extend along the value chain or develop extremely profitable businesses. Developers will sustain themselves comfortably with contract work and have the opportunity to strike it rich through content innovation. Content providers (and their lawyers) will grow rich through licensing deals, or will branch out into development and publishing. There is some risk of cannibalization with other entertainment channels. The primary risk for this group, though, is that high profits and increased access (through independent portals) will attract an overabundance of content. As with the proliferation of cable-TV content or Game Boy Advance titles, the marginal profitability of each work is driven toward zero and the consumer is overwhelmed with unsatisfying options.

Supporting Evidence

Recent developments that support this scenario include:

Premium Content Drives Partnerships: By offering well-known brands like *Who Wants to be a Millionaire* and *Trivial Pursuit*, Codetoy was able to partner with both handset manufacturers and operators to gain distribution. AT&T Wireless paid an undisclosed but reportedly huge fee for a several-month exclusive to Activision's *Tony Hawk Pro Skater 4* game. Digital Bridges was able to sell *Orange World* an exclusive to EA's *FIFA Football* in 7 European markets.

Premium Content Owners Dominate Other Channels: Though margins are falling, premium content owners and publishers command the largest revenue share in both the movie and the TV industries.

A Software Environment Dominates

In this scenario, one software environment dominates. One possible scenario has Microsoft entering the mobile entertainment market by leveraging its position in the mobile business market. Although

most handset manufacturers initially refuse to implement Microsoft's operating system on their devices, Microsoft hires contract manufacturers and small designers to develop handsets that are sold directly to operators. Microsoft's operating system becomes standard, limiting device differentiation to design characteristics. Microsoft extracts mobile content revenues through licensing fees as well as by selling products and services to developers, publishers and service providers. Operators will become reliant on Microsoft, which will strongly influence the relation between offline and online content. This scenario assumes an aggressive dominance by a closed and proprietary operating system vendor as opposed to industry dominance by a consortium or a company dedicated to open standards.

Opportunities and Risks in the Microsoft-Dominated Scenario

Driven by cross-platform Microsoft compatibility and synchronization, demand for handsets and connectivity will be strong in this scenario. With a technology standard on the handset, penetration may increase and the opportunity for subcomponents (graphic acceleration cards, sound cards) could emerge. Mobile device manufacturers will have to pay licenses for the Microsoft platform. The hardware trend will be toward commodity as the interface, cross-platform compatibility and standard developer interfaces pull momentum away from the hardware. Mobile operators will increasingly lose control over device specifications. They risk a "dumb pipe" future in this scenario. Operators are vulnerable to being played against each other as Microsoft extends its customer control from the offline world to the online one.

Portals, service providers, publishers and content owners would profit from a higher number of entertainment-ready handsets and a somewhat standardized online/offline platform. Premium content providers and publishers should not be negatively affected by a Microsoft-dominated scenario. Application developers may benefit from a standardized hardware and OS platform. Developers may find their margins at risk if Microsoft begins charging a license fee. Developers that fall out of favour with Microsoft risk being barred (explicitly or not) from mobile entertainment revenues. Both portals

and service providers face technology license fees that will increase as the market expands. Independent portals will be under significant threat as Microsoft extends its wireline Internet service provider businesses to the mobile environment.

Supporting Evidence

Recent developments that support this scenario include:

- Microsoft's Rollout: Microsoft is increasing its stake in the mobile market by connecting its Pocket PC platform to operator infrastructure in Europe and North America. The company has also supported the development of HTC-manufactured Smartphone, now being sold through Orange.
- Traditional Handset Companies Rallying: Device manufacturers recognize the threat and have joined forces under the auspices of the Symbian operating system.
- Smartphone features enforce Microsoft's position: Microsoft will be able to sell mobile-enabled business and consumer software solutions that offer synchronization with desktop versions.

Conclusion

The mobile entertainment industry, while still in its formative stages, shows signs of incredible potential. The existing value chain and the major drivers of its development will significantly affect the future of mobile entertainment. The four scenarios presented in this paper are the most likely models that will emerge after the industry stabilizes. While the scenarios are each characterized by a dominant player, the research makes clear that there are considerable revenue-generating opportunities to be leveraged by companies in all stages of the value chain. We are already seeing a number of enablers in the mobile entertainment value chain (WASPs; mobile delivery and portal provisioning companies) generating significant revenue as a result of building up a specialization in the value-chain. Consequently, the MEF believes that non-dominant players who develop a unique scalable service in the mobile entertainment value-chain while avoiding the identified pitfalls stand to gain substantially under one or more of the scenarios presented. By considering the technological and strategic impacts of each, individual companies should be more successful and the industry as a whole should benefit.

9.2 Digital Home, A White Paper by Digital Home Working Group

Consumers are acquiring, viewing, and managing an increasing amount of digital media on devices in the consumer electronics (CE), mobile, and PC domains. As such, they want to easily and conveniently enjoy this content—regardless of the source—across different devices and locations in the home. This trend is fuelled by the proliferation of digital media and IP networking, and supported by several leading market indicators.

- Digital Device Sales: Music players, cameras, camcorders, DVD players, multimedia mobile phones, and PVRs
- Broadband Adoption: DSL and Cable
- Home Network Adoption: Wired and wireless; ad hoc and infrastructure configurations

All these indicators point in the same direction—yearly growth and opportunity are at hand for CE, mobile devices, and PC manufacturers, software and application developers, and content providers. In the new digital world, CE, mobile, and PC devices will seamlessly interact to cooperatively enhance the consumer entertainment experience. In the past, convergence has been the popular term used in the industry for the joining of these worlds. However, consumers generally just want these devices to work better together.

A scenario

Connor and Elysia enjoy all forms of home entertainment. As such, they have amassed an impressive collection of home electronics, including a DVD changer, audio surround system and large-screen TV for the family room, a bookshelf audio system for the office, and a DVD player and TV for the bedroom. All this is in addition to a DV camcorder, a digital camera, a multimedia mobile phone, and a PC for editing and sharing their digital content.

Connor loves taking movies of the children and editing them on the PC. Elysia enjoys taking digital pictures, then arranging them and creating photo collages on the PC.

Both Connor and Elysia like to watch their digital creations on the family room entertainment centre. Connor copies his movie creations from the PC hard disk to the camcorder using 1394, then connects the camcorder to the family room TV with an analogue cable. Elysia copies her digital pictures to a memory card and inserts it into the camera, then connects the digital camera to the TV with an analogue cable. Of course, the CD-R creations they just carry from room to room, or to the car.

Both Connor and Elysia are happy that they can do these things, but they also feel that they should be able to have instant access to any content from any room, as soon as that content is created or brought into the house. One day Connor went to the local computer store and purchased a wireless home network kit and another PC. He connected the new PC to the family room TV and to one of the wireless access points. He connected the other access point to the other PC where all the audio, movies, and pictures are stored.

At first Elysia was very enthusiastic about Connor's project - but then came demonstration time. Connor used shared folders to publish the audio, video, and pictures on their wireless home network. When Connor demonstrated how to play audio from the PC, Elysia noticed that sometimes the audio would break up. Then, Connor demonstrated going to the shared video folder and playing a home movie. At this point, both Connor and Elysia were surprised. The video was very choppy and unsatisfying.

Elysia then asked how much this experiment cost. When Connor told her, she was very unhappy. "The old way may not be the most convenient, but at least it works!" And that's exactly what she returned to doing. What Connor didn't know is that his personally designed end-to-end wireless solution did not account for the special needs of digital audio/video streaming. Connor's initial home network attempt remains in operation - when Connor is at the controls. But Connor continues to search for interoperable products and solutions that fulfil the promise of home entertainment networking.

The Problem

Today, three islands exist in the home.

- m The PC Internet world where PC and PC peripherals communicate.
- m The broadcast world that serves set-top boxes and traditional consumer electronics.
- m The mobile world, consisting of multimedia mobile phones, PDAs, laptop computers and similar devices, that provides unparalleled connectivity and freedom of movement into and out of the home environment.

Consumers want devices in these three domains to work together in the home, but expectations have largely been unfulfilled. In order to build in interoperability between these digital worlds and win customer confidence, industry leaders must address the following challenges cited by consumers and substantiated by research.

Consumer challenges

- m Digital home products should be easy to install, provide obvious user value, and be affordable.
- m Digital home products must interoperate with each other and with existing consumer electronic devices like TVs and stereos. Manufacturers must also recognise that the vision of convergence has not been realised in the minds of the consumer.

Product Developers' Dilemma

- m Open industry standards are often too flexible - products built by different vendors many times do not interoperate well. Therefore, design choices should be narrowed through industry consensus to better achieve interoperability.
- m Current end-to-end solutions, based on proprietary vertical implementations, get products to market early - but have little impact on rapidly growing a new category. In summary, a digital home framework, defined by CE and PC industry leaders is required to enable an interoperable home network. Products built on this framework will enhance digital media distribution throughout the home.

The Vision

The digital home vision integrates the Internet, mobile, and broadcast islands through a seamless, interoperable network which will

provide a unique opportunity for manufacturers and consumers alike. In the future, a digital home can contain one or more intelligent platforms such as an advanced set-top box (STB) or a PC. These intelligent platforms can then manage and distribute rich digital content to devices like TVs and wireless monitors, and from devices like digital still cameras, camcorders, and multimedia mobile phones.

The Approach

In order to deliver on interoperability in the digital home, a common approach is required that focuses on three key elements:

- m Industry collaboration
- m Standards-based interoperability framework
- m Compelling products

The following is an overview of each of these elements.

Industry collaboration:

Alignment between key leaders in the CE, mobile, and PC industries on digital interoperability is an important first step. Historically, these industries have delivered innovative consumer products side-by-side but not necessarily in concert. None of these industries has the means to drive digital interoperability alone. However, each industry offers unique capabilities and attributes. CE and mobile device manufacturers have a history of creating new mass-market product categories, adding brand recognition, maintaining ease-of-use, and hitting attractive price points. As a complement, PC manufacturers differentiate on hardware and software development and integration. In addition, PC makers are known for delivering new products to market quickly through the development and adoption of standards. The success of a digital home interoperable network is dependent on creating new product categories and getting highly integrated devices to market quickly.

Industry collaboration is not limited to just CE, mobile, and PC manufacturers. It is an entire ecosystem of companies that together offer consumers a broad set of complementary products and services. An ecosystem properly designed for digital interoperability must start with the consumer in mind and include contributors that can help

bring all the necessary elements of the digital home network to market. Industry collaboration must encompass manufacturers, software and application developers, and service and content providers.

A collaboration of industry leaders can also facilitate industry marketing and promotion while encouraging development, interoperability, and support of digital home devices.

Standards-based interoperability framework:

While creating new product categories is important, industry leaders must first cooperatively develop an interoperability framework. This framework should define interoperable building blocks for devices and software infrastructure. It should cover physical media, network transports, media formats, streaming protocols, and digital rights management mechanisms. Standards for these areas are defined in many different forums, and compliance with them is an important first step. Ensuring device interoperability also requires the industry to come together to produce design guidelines so that the products of different vendors support a common baseline for the set of required standards. Since technology and standards continually change and improve, these design guidelines must also evolve over time and ensure continued interoperability as new and old technologies are mixed together in the digital home.

Compelling products:

Finally, diverse, interoperable products are necessary to provide consumers with broad, compelling experiences, and value throughout the digital home. Products in the digital home will embody one or both the two major functions discussed below. Digital Home Server (DHS) Devices provide media acquisition, recording, storage, and sourcing capabilities based on the digital home interoperability model, as well as content protection enforcement as required. DHS products will also include DHR device capabilities described below and may have intelligence, such as device and user services management, rich user interfaces, and media management, aggregation and distribution functions. Some examples of these devices include:

■ Advanced Set-Top Boxes (STB)

- Personal Video Recorders (PVR)
- PCs
- Stereo and home theatres with hard disk drives (e.g., Music Servers)
- Broadcast tuners
- Video and imaging capture devices, such as cameras and camcorders
- Multimedia mobile phones

Digital Home Renderer (DHR) Devices provide playback and rendering capabilities. Some examples of these devices include:

- TV monitors
- Stereo and home theatres
- Printers
- PDAs
- Multimedia mobile phones
- Wireless monitors
- Game consoles

Value Proposition

For digital interoperability to succeed, consumers, manufacturers, service providers, and content providers must all see a strong value proposition. Consumers are unlikely to adopt and pay a premium for interoperable digital home products if they do not deliver on their promise of performance, capabilities, and simplicity. Likewise, CE, mobile, and PC manufacturers will have little motivation to develop digital home products if they do not provide clear business opportunities. The same applies to content and service providers who are looking for new venues and capabilities to distribute entertainment and services.

The following is an examination of the value proposition for digital home products as it relates to consumers, content and service providers, and manufacturers.

Consumers

The consumer will be able to purchase digital home renderer/server devices that communicate and collaborate with each other, allowing simple and seamless access to content throughout their home. Consumers will benefit from greater convenience and ease of use, and will have more flexibility in selecting a range of prod-

ucts from different vendors. Consumers can also store the same content in their multimedia mobile phones and enjoy it while on the go. Finally, the assurance of digital home interoperability will instil confidence in consumers that the products they purchase will work well together and be future-proof.

Content and Service Providers

The building blocks for digital interoperability provide content and service providers with technical solutions that eliminate barriers for secure end-to-end connectivity and high-quality media streaming. This allows content and services to be delivered to more end-points in the home, increasing revenue opportunities for both content and service providers.

Manufacturers

As mature product lines slow and products become commodities, CE, mobile, and PC manufacturers are continually looking for new ways to differentiate and expand existing product categories while increasing their function and capabilities. Consumer migration from VCR to DVD players is a good example of manufacturers transitioning existing usages into new and improved usages. As another example, CE manufacturers have increased the value of the traditional TV by incorporating brilliant flat-panel screens, DVD players, game ports, and high-definition capabilities. Another example is the growing adoption of multimedia - including audio, streaming video, and imaging - as a standard feature in mobile devices.

The time-proven recipe described above yields increased value to the consumer - value they are willing to pay a premium for. Interoperable digital home products also fit this model. New home business opportunities can also be strengthened by:

- m Joint industry promotion of new CE, mobile, and PC categories.
- m Constructing an interdependent ecosystem of devices, software, and services.
- m Fostering consumer/retailer confidence in reliable and high-quality interoperable digital home devices.

Starting now on the path to digital home interoperability will one day make all of the following usage scenarios possible-and others not yet envisioned.

Easily acquire, store, and access digital music: From almost anywhere in the home, access an entire digital music collection stored on multiple, network-enabled devices. Instruct an intelligent DHS device to download music from a monthly subscription service or “rip” it from CDs, and store both on a variety of networked devices including PCs, jukeboxes, and portable audio players. Group and categorise the music to form a “virtual jukebox” for playback on any network-enabled playback device in the home.

Effortlessly manage, view and share digital photos: Arrive home from a family outing with a digital camera full of images - the wireless download feature auto-detects the home network and transfers all the photos to a media archive on a PC. As previously configured, a PC distributes the photos to the appropriate photo frames, PC screensavers, TV adapters, and other devices throughout the home. It even securely sends the images across the country to a photo frame in grandma’s digital home.

Take your favourite content with you: Keep a copy of your favourite audio and video in your mobile device to share with friends and family. At a party impress y o u r friends by streaming the newest music to the nearest wireless loudspeakers. Stream your latest home video directly from your mobile device to a TV set.

Enjoy distributed, multi-user content recording and playback: Using a universal remote, access any of the network-enabled set-top boxes, PCs, or TVs in the home and select programs for viewing, or for recording and later playback. Record multiple programs simultaneously utilising available tuner resources embedded in network-enabled TVs, dedicated PVRs, set-top boxes, and PCs. While viewing live programming from networked TVs, pause and resume viewing using networked storage resources.

Interoperability Framework

The digital home will consist of a network of CE, mobile, and PC devices that cooperate transparently, delivering simple, seamless interoperability that enhances and enriches user experiences. This network is the communications and control backbone for the digital home and is based on IP networking and UPnP technology. Interoperability is accomplished between devices when they are capable of transparently collaborating on a particular service that they provide to the user. Typically, this includes the capability for these devices to communicate with each other and exchange meaningful information. The digital home building blocks needed to facilitate this interoperability are described below.

- m Transparent connectivity between devices inside the digital home: Includes networking compatibility at the link layer (layer 2) for devices directly connected to each other. When devices of different layer two technologies need to communicate, appropriate layer 2 bridging and layer 3 routing must exist between these devices. The overall goal is to enable end-to-end connectivity between all devices exchanging information over the home network.
- m Unified framework for device discovery, configuration and control: The ability for any device on the digital home network to discover the presence of other devices and services on the network, and identify their functionality and associated capabilities. It also includes the ability to configure these devices and services, and control their operation with appropriate ease-of-use.
- m Interoperable media formats and streaming protocols: Once devices can communicate with each other, they need to agree on a common streaming protocol in order to establish media streaming sessions. These devices also need to agree on the media formats that they support to ensure that the media can be shared and consumed.
- m Interoperable media management and control framework: An interoperable media management framework across all devices in the digital home enables the proper exchange of media information and control between devices provided by different vendors. It must include the ability to organise, browse, search, and select media items to be processed, in addition to the ability to control the operation of media streaming sessions.

- m Compatible quality of service mechanisms: Quality of Service (QoS) for networking is essential when transferring high-definition media streams in the digital home, particularly in the presence of best effort traffic. For this to work, vendors must agree on how to address QoS in the digital home; but devices must still interoperate even if there are no QoS mechanisms implemented.
- m Compatible authentication and authorisation mechanisms for users and devices: A number of authentication and authorisation mechanisms are being considered by device manufacturers and application developers to provide appropriate security for access and control. It is imperative to settle on a compatible authentication and authorisation framework to enable devices to request and/or grant access to particular devices and services in the home.

Additional Elements

In addition to the building blocks described above, other capabilities and issues need to be investigated and addressed for the digital home. Following are important capabilities that the DHWG will investigate further.

Digital Rights Management/Content Protection

In order for premium digital content to be made available for use with digital home devices, content providers understandably insist that their content be protected from unauthorised copying and use. At the same time, consumers expect to be able to store, transport, and use that content at any location and on any device within their digital home. Balancing the providers' need for protection and the consumers' fair use rights and expectations, while providing interoperability between all networked devices that might handle the content, is a complex problem. Content protection methods must also be user friendly.

Today, there are several Digital Rights Management (DRM) technologies available to designers and content providers. One or more of these solutions will typically be provided on digital home devices to protect, administer, and distribute stored content, as one component of content protection in the digital home. Other components of DRM that support additional user scenarios are being considered for development in the UPnP Forum and elsewhere in the industry.

While the digital home design guidelines will not mandate specific DRM and content protection solutions, the DHWG will provide a useful venue for those who share the digital home vision of device interoperability. Collaboratively, vendors can understand and document the range of technical and business requirements for achieving the required balance between protection, availability, and usability. This work will aid device designers and content providers in implementing Digital Rights Management methods available today and in the future, to foster an integrated, user-friendly, and backward compatible system that meets the rights, the needs, and the expectations of all stakeholders.

Manageability

Consumer adoption rates of digital home products will depend on the overall quality of experience users have, not just when using these products, but also when a problem arises involving one or more of them. The introduction of a variety of networked products into the home may make the resolution of issues by the consumer and support provider a difficult and expensive prospect. The more management information that can be given to the consumer in a meaningful manner about the health of their digital home devices, the less likely they are to require support. Should a consumer require support for a digital home device, they should know who to call and not be faced with the situation where they are passed on to another company without satisfactory resolution of their problem.

The DHWG will provide a useful venue for interested members to discuss and document technical and business issues for how digital home devices can be best managed and supported.

IEEE 1394 in the digital home

Home entertainment devices are increasingly moving from analogue to digital formats and interfaces. Devices such as TVs, AV receivers, and DVD players in the home entertainment cluster may use IEEE 1394 for short-distance, isochronous media transfer and control. 1394 also has the ability to transport IP, and this capability will enable UPnP technology over IP to extend its reach from the

home network to 1394 devices. Over time, a variety of approaches can be used to extend the benefits of UPnP technology into the 1394 cluster and enable bidirectional media transfers with the home network including layer 2 bridging, layer 3 routing, or translating at a higher level. The desired end state is to transport IP across 1394 and have 1394 devices support UPnP technology directly. The DHWG will investigate and recommend suitable methods and strategies for allowing 1394 devices to support UPnP technology over IP.

Design guidelines scope

In order to deliver on digital interoperability in the home, a common set of industry design guidelines is required that allows vendors to participate in a growing marketplace, leading to more innovation, simplicity, and value for consumers. digital home design guidelines must specify the interoperable building blocks that are available to build platforms and software infrastructure. Full implementation of an interoperability framework that meets the high-level requirements set forth in the preceding section will not be complete until after 2006 and will require phasing of design guidelines.

Over time, as new technology and standards become available, the design guidelines may broaden to cover other usage areas such as home control, communications, and more advanced entertainment scenarios.

The basic criteria for specific technology ingredients selected for the digital home guidelines for 2004 to 2005 and beyond include:

- ™ Technology should be based on standards from standards bodies, SIGs, and industry forums, or be readily available and in relatively wide deployment on a variety of platforms in the marketplace. Intellectual Property should be available on reasonable and non-discriminatory terms for all vendors.
- ™ Technologies should enable interoperable products based on target usages to be brought to market in 2004 and 2005.
- ™ In cases where multiple digital home approved technologies are specified, it should be possible to bridge or translate as required between any two technologies. For example, there should be means to seamlessly bridge between wired and wireless network-

ing technologies. The following sections cover some of the key technology ingredients for the digital home design guidelines.

The IPv4 family of protocols is the foundation for networking and connectivity in the digital home. IP also provides the underlying network communications for devices on the Internet. IP is based on industry-standard specifications implemented and supported in a wide range of devices with more than two decades of deployment in government, academic, and commercial environments.

There are several advantages to using IP in the digital home:

- m IP allows applications running over different media to communicate transparently. IP will run over many different media without any awareness required by applications as to the underlying media. For example, a PC or advanced STB may stream media content to a TV in the master bedroom through an Ethernet cable to an 802.11 Access Point, and then wirelessly to the TV. With IP, the media server and the TV are unaware that the media content travels over two separate physical media. For direct peer-to-peer communications of a mobile device transmitting to a digital home device, IP provides the unifying framework to make applications independent from the actual transport technology.
- m IP allows connecting every device in the home to the Internet. Since IP is the protocol of the Internet, any device in the digital home can be potentially connected to any other Internet-connected device in the world.
- m IP connectivity is inexpensive. Because it is ubiquitous, economies of scale and competition combine to make IP physical media implementations available at lower cost than other technologies.

Recognising these advantages, the design guidelines for networking and connectivity are intended to facilitate simple, interoperable connectivity, while meeting the digital home's needs today and into the future.

The IETF is standardising IPv6 as an improved version of IP and is actively pursuing a range of transition techniques for a smooth migration from IPv4 to IPv6. Many of these techniques will be applicable to home devices and residential gateways.

IPv6 provides built-in auto-configuration and enhanced support for mobility and security. IPv6 also provides a much larger network address space allowing more devices to be transparently interconnected. IPv6 is gaining acceptance in the CE, mobile, and PC device industries as the long-term solution to the shortage of IPv4 addresses while maintaining end-to-end transparency.

Support of IPv4 is essential for interoperability of devices on the digital home network, but in the longer term, IPv6 support will become more important. The future transition from IPv4 to IPv6 will be handled in the digital home design guidelines in a manner that enables devices based either on IPv4 or IPv6 to work well together.

Device and service discovery and control enables devices on the home network to automatically self-configure networking properties such as an IP address, discover the presence of other devices on the network and their capabilities, and control and collaborate with these devices in a uniform and consistent manner. The UPnP Device Control Protocol Framework (DCP Framework), Version 1, addresses all of these needs to simplify device networking in the home, and is the device discovery and control solution for digital home devices.

The UPnP Forum steering committee is currently looking at an improved version of the UPnP DCP Framework, Version 2, that integrates better with the emerging Web services model. However, for the next several years Version 1 of the UPnP DCP Framework meets the needs of the digital home and any migration to Version 2 will be handled in the digital home design guidelines in a manner that enables devices based on either Version 1 or Version 2 to work well together.

Media format and transport model

The digital home media format model is intended to achieve a baseline for network interoperability while encouraging continued innovation in media codec technology. Improvements in media codec technology result in better network bandwidth utilisation and media quality for a given bit rate. digital home requirements on media format support apply to media content that passes over the

home network from a DHS device to a DHR device. The digital home media format model defines a set of required media formats and a set of optional media formats for each of the three classes of media: imaging, audio, and video. The network interoperability model for media formats is as follows:

- m All DHS devices and DHR devices must support all formats as required for any of the media classes they support. All DHS devices and DHR devices may support any additional formats designated as optional for any of the media classes they support.
- m Any DHR device must be able to receive content from any DHS device. A DHS device may stream content in its native format if the receiving DHR device supports such native format. If the DHR device does not support the content's native format, the DHS device must transcode the native format to one of the applicable required formats, or to a format understood by the rendering device. Interoperability for audio devices in the digital home is ensured through the requirement to support the LPCM audio format. LPCM is an important, uncompressed audio format widely used today for the interchange of single and multi-channel premium-quality audio streams between digitally interconnected devices. Direct transmission of LPCM between devices is the means for ensuring the highest fidelity of premium audio content. The technical requirements to create an LPCM stream from any source content and to transmit that stream are well within the capabilities of present day and future devices and digital interconnects. As a required format in the digital home, LPCM ensures the broadest range of interoperability with the lowest possible cost and complexity.

LPCM represents a reasonable technical choice for a required audio format, particularly in wired environments. Wireless networking is rapidly growing in importance for home networking and is expected to become an important means of distributing media in the home. For a wireless device, or a resource-constrained device such as a portable player with limited memory and power supply, compressed audio formats in the optional format set provide more efficient usage of network bandwidth, battery power, and storage. Vendors whose products fall into these classes should seriously consider supporting one or more of the optional compressed audio for-

mats. Over time, new media formats may be added to the required or optional format sets. At all times, the required set shall only include formats that are open standards.

The required and optional formats model brings the benefit of continued innovation in media codec technologies to the digital home while ensuring interoperability. DHR and DHS device vendors can differentiate their products by including support for one or more of the optional media formats while maintaining interoperability with all DHR devices by adhering strictly to the requirement to transcode to one of the required, open standard formats.

Alternatively, a DHS device may transcode from any format to one of the optional formats understood by a DHR device. This allows vendors to take advantage of better audio and video quality and, when possible, make more efficient use of available media storage and network bandwidth resources without sacrificing interoperability with devices that only implement the required format set. Digital home devices that source or render media content across the home network must also support a small set of baseline media streaming transports such as HTTP. The transfer scenarios that can be supported include:

- m A transfer from a DHS device to a DHR device, even if there is no actual immediate rendering of the media content. This may occur for an intelligent DHS device that distributes or replicates media content on the home network.
- m A transfer from a DHS device to an intelligent DHS device. Note that the intelligent DHS device would logically be acting as a DHR device in this scenario even if there is no immediate rendering of the media content. This may occur for an intelligent DHS device that aggregates, organises, processes, and/or archives media content on the home network.

Media management, distribution, and control

Media management and control enables devices and applications to identify, manage, and distribute media content across the stationary home network, or to transfer it to mobile devices. UPnP Audio/Video (AV) technology addresses all of these needs for the home network and is the media management and control solution for digital home

devices. UPnP AV specifications define the interaction model between UPnP AV devices and associated control point applications. UPnP AV devices can include TVs, VCRs, CD/DVD players, set-top boxes, stereo systems, still-image cameras, electronic picture frames, and PCs. The UPnP AV architecture allows devices to support entertainment content in any format and over any transfer protocol. UPnP AV specifications define two types of logical devices on the home network: Media Servers and Media Renderers.

The specifications also define four services hosted by Media Servers and Media Renderers.

- m **Content Directory Service:** Enumerates the available content (videos, music, pictures, etc).
- m **Connection Manager Service:** Determines how the content can be transferred from the Media Server to the Media Renderer devices.
- m **AV Transport Service:** Controls the flow of the content (play, stop, pause, seek, etc.).
- m **Rendering Control Service:** Controls how the content is played (volume/mute, brightness, etc.).

Putting It All Together

The digital home offers significant new opportunities for the CE, mobile, and PC industries. The vision articulated here for digital interoperability will require considerable effort to achieve. The industry needs to align, coordinate, and deliver at several levels as follows:

- m **Usages:** The CE, mobile, and PC industries must define and align on a usages roadmap that will drive consumer acceptance of a new category of interoperable digital home products. By necessity, this roadmap will be dynamic and must progressively reflect available technology and standards over time. Digital entertainment and media usages will most likely be the driving factor for early consumer adoption, and the availability of technology and standards dictates a planned evolution from personal to commercial media usages.
- m **Interoperability Framework:** CE, mobile, and PC industries must:
 - 1) Align on the framework for digital interoperability,
 - 2) Continue to participate in key standards arenas, such as ISO, the UPnP Forum, CEA and the 1394 Trade Association, to ensure future usages and capabilities are supported, and

- 3) Translate the technology and standards into concrete design guidelines that can be used to build interoperable digital home products. To support a dynamic usages roadmap, the design guidelines must march forward over time.
- m **Products:** To launch the digital home concept, adapters are needed that bridge the CE, mobile, and PC worlds and support consumer's existing home devices. Such adapters can progressively support the expected, growing, mainstream market through increasing integration of common functions. To continue to grow the digital home category and fuel further demand, CE, mobile, and PC vendors must routinely deliver new and exciting digital home products that meet consumer needs for functionality, reliability, performance, and simplicity.
 - m **Open Standards:** To ensure rapid, broad adoption of the digital home concept, all of the mandatory elements in the design guidelines and interoperability framework will be based strictly on open industry standards. Standards bodies and industry groups such as ISO, the UPnP Forum, CEA, the 1394 Trade Association, and others, will continue to be the venue for development of technical specifications that service the digital home ecosystem. The DHWG founding companies are committed to establishing strong, complementary working relationships with these organisations, and others, in order to constructively reference their specifications, communicate appropriate feedback, and jointly pursue new standards and design guidelines.

The Digital Home Working Group will develop digital home design guidelines to provide CE, mobile, and PC manufacturers with the information needed to build interoperable digital home platforms, devices, and applications. This collaborative effort will result in the creation of a networked media products category for the home, providing new business opportunities for the industry and new experiences that benefit consumers.